

Effects of Social Relations on Mortality in the Context of Grandparenting

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Abstract

Issues of health and well-being have received considerable attention as a way to help grandparent caregivers. There is growing evidence that grandparenting is beneficial to grandparent caregivers' health, yet acting as grandparent caregiver also is detrimental to health and social relations when a grandparent provides an extensive level of care to grandchildren. The extent to which grandparent caregiving benefits or harms the health of a grandparent is still unknown; mortality specifically has not been systematically studied. Moreover, although altruistic behaviors towards others have been shown to have beneficial effects on caregivers' health in general, there is little information regarding social relations of grandparent caregivers and their impact on mortality.

This study aims to investigate the roles of different aspects of social relations among community-dwelling older adults, examining whether aspects of social relations, including social networks, received functional support aid, and perceived support quality mediate the association between grandparent caregiving and mortality. The data were drawn from the 2008 and 2014 Health and Retirement Study ($N=1,196$). Results of survival analyses indicate that custodial and co-parenting grandparents had higher all-cause mortality risks relative to occasional babysitting grandparents over the subsequent 6-year observation period; however, for the custodial grandparents, the associations were not significant after health, health behaviors, and depressive symptoms were added into the model. Latent class analyses were conducted to identify the social

network typology with seven indicators of interpersonal relationships and activities. Results from the latent class analysis identified four clusters: diverse, friend-focused, family-focused, and restricted/ non-friends. Specifically, family-focused network was significantly associated with increased mortality risks among grandparents. Custodial grandparents received more functional support but perceived less positive support, which further enhanced the negative associations between custodial grandparenting status and increased mortality risk. This study suggests that community-based support to strengthen social networks may be beneficial to older grandparents and that improved positive relationship quality matters for older adults' well-being.

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Dedicated to My Family and My Three Daughters, Yelim, Hyelim, and Sorim

1.0 INTRODUCTION

1.1 BACKGROUND

Caring for grandchildren is considered one of the most challenging but significant events of later life. In the United States, approximately 2.7 million grandparents were responsible for the basic needs of one or more grandchildren under age 18 living with them, and approximately 1.01 million grandparent caregivers were age 60 and older in 2012 (Ellis & Simmons, 2014). Moreover, the number of older grandparent caregivers is increasing. In 2010, grandparent caregivers age 60 and over occupied 33 percent, up from 29 percent in 2000 (Livingstone, 2013). Grandparents caring for their grandchildren experience numerous challenges, which contribute to adverse physical and mental health outcomes (Sprang, Choi, Eslinger, & Whitt-Woosley, 2015). Becoming a grandparent caregiver of a grandchild is also linked to weakened wider social networks, resulting in an increased sense of social isolation (Landry-Meyer, 1999). Those challenges are relevant to high levels of stress and burden with childcare. If grandparents consider childcare as a source of happiness not as a burden or disruption to their daily live, it could benefit grandparents' health and well-being.

Despite the widespread provision of grandparental childcare, there is a lack of knowledge on the extent of grandparental involvement (Chen & Liu, 2011). It is often assumed that co-residential grandparents provide extensive childcare although data do not provide the extent of their involvement. However, little is known about the effects of non-residential grandparenting on health and well-being. Therefore, identifying the prevalence and intensity of childcare involvement by comparing co-residential and non-residential grandparents would

improve our knowledge about grandparent caregiving.

Furthermore, the effect of social relations on health is currently well acknowledged (Antonucci, Birditt, & Webster, 2010). The literature has reported that greater social integration and support is associated with positive health-related outcomes, including fewer depressive symptoms, better self-rated health, improved life expectancy, and lower mortality (Antonucci, Fuher, & Dartigues, 1997; Tay, Tan, Diener, & Gonzalez, 2013). Positive social interaction with and support from spouse, family, and friends also has a great impact on older adults' health in particular. Some research has shown that helping behavior among older adults is associated with accelerated recovery from depressive symptoms that accompany spousal loss (Brown, Brown, House, & Smith, 2008) and reduced mortality risk (Brown et al., 2003) even among caregivers. However, although many grandparents take on the role of caregiver to their grandchildren, little is known about the effects of social relations on mortality among grandparent caregivers. An understanding of this relationship is valuable to improve our understanding of how grandparenting is linked to health and survival chances in old age.

1.2 STATEMENT OF SOCIAL PROBLEM

1.2.1 Definition of Grandparent Caregivers

The National Family Caregiver Support Program (NFCSP) defines “a grandparent caregiver” as a grandparent or grandstepparent of a child, or a relative of a child by blood, marriage, or adoption, who is 55 year of age or older and 1) lives with the child, 2) is the primary caregiver of the child because the biological or adoptive parents are unable or unwilling to serve as the

primary caregiver of the child; and 3) has a legal relationship to the child, such as legal custody or guardianship, or is raising the child informally (Generation United, 2007).

A legal relationship with the grandchild (adoption, full custody, temporary custody, or guardianship) defines the grandparent's caregiver role as custodial (Jendrek, 1993). Grandparents raising grandchildren informally are defined by their role of responsibility, but they lack any corresponding authority. At the same time, any grandparents who live with their grandchildren, assume responsibility for some, if not all, of the grandchild's daily care (Jendrek, 1993). Other grandparents may share responsibility for grandchildren in response to their adult child's financial need, divorce, or work commitment (Musil & Ahmad, 2002).

Fuller-Thomson and Minkler (2001) classified caregiving status into five categories according to caregiving hours; custodial, extensive (more than 30 hours a week of childcare), intermediate (10-29 hours a week of care), and occasional (less than 10 hours a week of childcare) caregivers, and non-caregivers. They also highlight the different characteristics of extensive caregivers vs. custodial grandparents. In their analysis, extensive caregivers were significantly younger than non-caregivers, and they were likely to be in better health; significant differences were found between extensive and custodial caregivers. The latter were more likely to be unmarried, to be female, and to have more grandchildren, which is a major difference from earlier studies (Fuller-Thomson, Minkler, & Driver, 1997).

According to Fuller-Thomson and Minkler (2001), the presence of co-resident children is a strong predictor of extensive as opposed to intermediate care provision. Such high rates of co-residence may reflect fewer living arrangement options as a result of low income and related factors (Fuller-Thomson & Minkler, 2001). It is often assumed that those who live with grandchildren share caregiving responsibility with adult child(ren), but the extent of the care they

provide could varies widely from person to person (Chen & Liu, 2011). Although extensive caregivers were identified to be from more vulnerable populations than their peers providing intermediate care, they more closely resemble intermediate caregivers than occasional caregivers (Fuller-Thomson & Minkler, 2001). Thus, this study categorizes grandparent caregiving status as 1) occasional non-resident grandparents, 2) intermediate/extensive non-resident grandparents, 3) co-parenting (co-resident) grandparents, and 4) custodial grandparents.

1.2.2 Definition of Social Relations

Social relations have been defined and measured in a variety of ways but are most often understood as an umbrella term which includes multiple dimensions; these dimensions are often referred to as structural social network, functional social support, and support quality; each of which influences health in unique ways (Antonucci, 2001). According to Holt-Lunstad et al. (2010), broadly, social networks are the structural characteristics of social relations, such as the amount of contact with others or the amount of time spent with others, while social support functions as a transactional process.

More specifically, social support is the function or exchange of what is given or received (Antonucci et al., 2010). The concept of social support has been defined in many ways. Some have defined support on the basis of the individual's perception of social support; others have focused on types of social support, that is, categories of behaviors or actions that are considered supportive; and still others have suggested that support should be defined in terms of its positive or negative effects (Antonucci, 1985). For example, Tolsdorf (1976) defined social support as any action or behavior that functions to assist the focal person in meeting his or her personal goals or in dealing with the demands of a particular situation. House (1981) referred to four types

of social support; emotional (involving empathy, love, caring), appraisal (information relevant to self-evaluation), informational (to aid with coping), and instrumental (tangible aid or help). Kahn and Antonucci (1980) developed a model and found a trichotomy of aid (instrumental support), affect (emotional support), and affirmation (acknowledgment or agreement with another's statement or act) most useful.

While social support is based on supportive social interactions, the structure of the social network is assessed by counting the individuals who provide certain types of support or supportive actions and by mapping formal relationships (i.e., spouse, employee) (Antonucci, 1985). Most people have focused on the social connectedness of social networks and consider those people who exchange supportive interaction to be network members (Hirsch, 1981). In addition, formal relationships, such as family member, co-worker, or friend, are added in the direct and indirect linking of a group (Lin et al., 1981). Furthermore, researchers have added living arrangements, household composition, and marital status as criteria for network membership (Berkman, 1995). Social networks are defined in terms of structural properties such as size, stability, homogeneity, symmetry, complexity, and connectedness (Kahn & Antonucci, 1980). In general, social support is regarded as functional behaviors, and social networks are regarded as structures of social relations.

The third dimension of social relations, social support quality can be positive, negative, or ambivalent (Bentson et al., 2002). Originally, it was believed that older adults show a greater commitment to the family than younger members and report positive emotions towards their children (e.g., Giarrusso, Feng, & Bengston, 2005). However, most recently studies have identified both ambivalent and negative relationship quality. If dysfunction of the adult child is

an issue, the grandparent-parent relationship can be a major cause of stress for grandparents (Shakya et al., 2012).

1.2.3 Statement of Social Problem

Social and economic changes, along with increased life longevity have impacted inter-generational relationships and led to an increase in the number of grandparents raising grandchildren (Hayslip & Kaminiski, 2005). As a result of their children's family crises (i.e., divorce, alcoholism, teenage pregnancy, parental abuse, or abandonment etc.), grandparents often have to accept a parental role and provide safeguards during times of strain (Hayslip, Shore, Henderson, & Lambert, 1998). Some grandparents choose to care for their grandchildren; others must be pushed to take the role. Given the sudden and often stressful circumstances surrounding such situations, grandparents are not well prepared to provide parenting skills and deal with normal developmental changes in their grandchildren (Hayslip, 2003). Since such social changes in family composition have implications for grandparents' well-being and health, it is important for social workers, health care providers, and service providers to understand the role of grandparents in family caregiving and the challenges they face in order to improve their health and well-being.

A substantial body of research has documented the challenges for grandparents raising grandchildren and suggested that grandparent caregivers are at an elevated risk of financial strain, poor physical and mental health, social isolation, role overload and role confusion, stress and related issues (Fuller-Thomson & Minkler, 2003; Hayslip & Kaminski, 2005; Whitley, Kelley, & Campos, 2013). Changes in their social roles could also be stressful to their social relations. As documented by Birditt and colleagues (2010), adult children, although they can also

be the greatest source of joy and pride for their parents, can nevertheless be a source of stress when they make too many demands and put a strain on their parents' resources.

Moreover, in old age, there is an increasing risk of limitations or losses in health and social contacts. Coping with familial difficulties may amplify the grandparent's social isolation from their age peers and further interfere with their relationships with others. Grandparents may encounter feelings of loss, anger, and guilt, which contribute to psychological distress, because the caregiving role usually involves helping their adult child with his or her problems as well (Conway, Jones, & Speakes-Lewis, 2011).

At the same time, grandparents are likely to be increasingly called to provide both emotional and instrumental support to family members; they themselves have fewer family members on whom they can rely when they are in need (Antonucci & Wong, 2010). As a result, caring for grandchildren may lead to negative health outcomes (e.g., Fuller-Thomson & Minkler, 2000; Kelley, Whitley, & Campos, 2013). For example, the incidence of diseases such as depression, diabetes, hypertension, and insomnia is higher among grandparent caregivers (Minkler et al., 2000).

Caring for grandchildren is not always associated with adverse health outcomes. Recent studies revealed that there may be benefits from limited caregiving, that is, a moderate amount of time spent on caregiving may be helpful to grandparent caregivers' health. For example, Burn and colleagues (2014) found that grandmothers who spend one day a week caring for their grandchildren may have a lower risk of developing Alzheimer's and other cognitive disorders compared to those who care for grandchildren for five days or more per week. As one aspect of social engagement, the effort involved in caring for grandchildren and the activities engaged in during the caregiving can be considered cognitively stimulating and thus can be expected to

influence cognition (Burn et al., 2014).

According to Ross (2006), most grandparents described the grandparent role as rewarding and contributing enormously to their quality of life. An added benefit of looking after grandchildren is that grandparent caregivers may also strengthen their relationship with their own children (Christiansen, 2014). However, there is still a lack of research on later-life social relationships among grandparent caregivers (Burn et al., 2014).

1.3 STUDY OBJECTIVES

In the last two decades, health and well-being initiatives have received considerable attention as a way to help grandparent caregivers. As mentioned above, there is growing evidence that grandparenting is beneficial for grandparent caregivers' health, yet acting as a grandparent caregiver can also be detrimental to health and social relations when a grandparent provides an extensive level of care to grandchildren (Drew & Silverstein, 2007). The extent to which the potential benefits or harms of grandparenting affect health and in what way, positively or negatively, is still a growing concern; specifically, mortality has not been systematically studied (Hilbrand et al., 2017).

Moreover, although altruistic behaviors towards others (e.g., grandchildren) have been shown to have beneficial outcomes for caregivers' physical and mental health, including reduced risk of morbidity and mortality (Brown et al., 2003), there is little information about social relations among grandparent caregivers and their impact on health outcomes. Those epidemiological studies about the effects of social relations on older adults' health specified certain aspects of social relations, limiting the scope of these studies. It is necessary to explore

how various social relations can either help or hinder grandparent caregivers' well-being using a multi-dimensional perspective. A convoy model can provide such a perspective.

In a convoy model, social relations accumulate over time and influence both morbidity and mortality. Model elements include structural characteristics, such as number, age, gender, role relationship, and years known of network members; support exchanged with network members such as love, tangible aid, and advice; and evaluation of these relationships, that is, whether one feels that the relationships are positive or negative and whether one is satisfied and/or happy with them. Because most grandparent caregivers provide emotional and instrumental support to grandchildren, the model needs to focus on how grandparents' received or perceived support from their convoy is related to their health. Thus, the present study uses a convoy model to investigate the roles of different aspects of social relations in the association between grandparent caregiving and mortality among community-dwelling older adults by examining whether aspects of social relationships entailing social networks, received functional support aid, and perceived support quality mediate the association between grandparenting and mortality.

2.0 THEORIES

This chapter describes the theoretical framework utilized in this study in detail. The convoy model of social relations provides an overall theoretical framework for current study. The proposed theoretical framework has been developed by adopting and modifying the convoy model of social relations. The model was derived from the contextual basis of role theory, as well as the fields of social networks and social support (Kahn & Antonucci, 1980). It focuses on the life-span nature of close social relations. Additionally, the Berkman model (2000) is introduced to illustrate how social relations influence health. The multi-dimensional measure of social relations may be more predictive of mortality than any single component throughout the social relation pathways.

2.1 ROLE THEORY

Role theory, which provides the basic context for the convoy model, deals with one of the most important features of social life, that is, characteristic behavior patterns or roles (Biddle, 1986). It explains roles by presuming that persons are members of social positions and hold expectations for their own behaviors and those of other persons. In a society, people have and are a part of many role relationships. The result of the various interactions can have positive or negative consequences on the person, family, and/or other roles a person has (Goode, 1960). These roles arise from: 1) the person who is directly connected to others in one's social network and 2) broader expectations of one's role and how one must perform it. Importantly, role positions may

change over time, highlighting the life-course nature of convoys. Roles may be ascribed, developed, and achieved through social interaction (Antonucci et al., 2010).

At some point in life, people who have many roles are likely to experience role strain, which Goode (1960) defines as “the difficulty of fulfilling role demands” (p. 483). Strain becomes inevitable and is a normal result as people at various times are unable to meet all of the expectations of a given role (Goode, 1960). The historical development of role strain is drawn from structural-functionalist and symbolic interactionist perspectives (Ward, 1986). In general, role is defined as those “behaviors of one or more persons within a certain context.” implying individual or group behaviors (Biddle, 1979, p.58). Symbolic interaction is another theoretical orientation which shapes the context of role strain. Mead (1934) developed this sociologic thought, which highlights the meanings of symbols for individuals within roles. Symbolic interaction could reflect individual interpretations of internal and external cues through the process of interaction. Both approaches are important in the development of the concept of role strain although the symbolic interactionist approach has wider range and capabilities within complex social structures (Rose, 1962).

From the structuralist perspective, the role of “grandparent” invokes images of traditional expectations of visiting and not interfering with parental correction; thus, the grandparent-grandchildren family type is relatively unstructured and lacks formality. Interactionists suggest that the grandparent role is developed and interacted within individual family contexts. Landry-Meyer and Newman (2004) identify three concepts of role theory to apply to the context of grandparents raising grandchildren; 1) role timing, 2) role ambiguity, and 3) role conflict. Role timing focuses on the effects of the off-time grandparent caregiver role. Since young grandparents have other roles, raising grandchildren may bring different experiences than it

might to older grandparents. Role ambiguity occurs when grandparents are unsure of how to enact the role of surrogate parent due to the lack of guidelines or norms. Since many informal grandparent caregivers do not have legal authority for their grandchild, they face barriers in parental role enactment in terms of areas such as school enrollment, medical care, and social service provision (Landry-Meyer & Newman, 2004). Finally, role conflict often occurs in trying to coordinate the demands of the caregiver role and the traditional grandparent role. Because grandparents must consider themselves the parents of their grandchildren, they often struggle in situation where they have to confront the demands of idealized stereotypes of grandparents' roles.

Most role theorists agree that role strain is a common result of playing several roles simultaneously (Marshall & Barnett, 1991). Haddock and Rattenborg (2003) use the scarcity and expansion hypotheses to elucidate the impact of combining multiple roles. The scarcity hypothesis of role involvement focuses on the number of roles a person has and the available personal resources. As the number of roles and responsibilities increase, the potential for role overload and psychological stress are higher (Haddock & Rattenborg, 2003). This hypothesis is based on the assumption that people have a daily reservoir of time and energy. According to Goode (1960), the amount of time and energy is dependent on factors such as perceived value of the role, demands of the role, ability to fulfill the role, and the consequences of role involvement. Since committing to multiple roles limits the resources a person can devote, a person who attempts to manage several roles "will be (come) the victim of role conflict...since any degree of commitment to one role will detract from his commitment, and chances of success, in the other, simply in terms of availability of time and energy" (Marks, 1977, p.924).

When a person becomes overly burdened and/or experiences tension in the various roles,

psychological distress often develops. In cases where the burden is too heavy, the person must find a way to regain their intrinsic motivation to reduce role strain. Goode (1960) suggested engaging in role bargaining or leaving a specific role relationship as a strategy to reduce strain. For some grandparents, the role of grandparent may include occasional babysitting with limited responsibilities, which is mostly not related to negative effects on health. However, for grandparents living with their grandchildren or providing full-time care, the responsibilities related to that role are highly stressful and interfere with their daily lives or relationship with others (Chen & Liu, 2011). The increased time pressure, stress, and physical demands could be harmful to health.

On the other hand, researchers have given their attention to the benefits of engaging in multiple role responsibilities, focusing on the greater social connectedness and integration (Moen, 2001). Sieber (1974) presented the “expansion hypothesis,” which posits that the gains associated with multiple roles offset the stress of role management. For example, multiple role occupancy is strongly associated with positive health outcomes as a result of the increases in social networking and emotional satisfaction (Adelmann, 1994). Older adults may experience limited opportunities for maintaining and developing close relationships that involve reciprocal exchanges of support as their social roles are reduced (Rook & Sorkin, 2003). In this case, upholding multiple roles may have positive health outcomes, since multiple roles result in increased social networking, resources, power, prestige, and emotional satisfaction (Moen et al, 1992).

2.2 LIFE COURSE PERSPECTIVE

As a new paradigm, life course perspective calls attention to rapid social change and population aging and how they contribute to the complexity of changing family processes. During the late 1920s and early 1930s, three longitudinal studies for child development conducted by the Institute of Human Development followed their young study samples up to the middle years and later years (Elder, 1998). However, they could not address the generated issues using theories available during that time, when social scientists looked at human behavior from two perspectives: a social relations approach, represented by functionalism, exchange theory, and ecological systems theory; and a temporal approach, used to examine lives followed or explained longitudinally (Black, Holditch-Davis, & Miles, 2009).

The complexities of people's lives require exploration of the complicated interrelationship of social structures and the impact of time, place, and history on individuals' lives (Giele & Elder, 1998). The special interest to the theory is the differentiation that occurs across subgroups and particularly how memberships in these subgroups influence the social pathways that are available to individuals (Antonucci et al., 2010). These social pathways are defined by sequences of events and transitions, as well as the roles and experiences of individuals (Alwin & McCammon, 2003; Settersen, 2007). Thus, the life course perspective assumes that grandparental involvement is associated with place and time, and furthermore, that each relationship between family members is influenced by each person in the family connection (Cox & Paley, 1997).

Elder (1998) defined four concepts of the life course theory that can be applied to grandparent caregiving. The four concepts are: 1) the interplay of human lives and changing historical times and place, 2) human agency in choice making and social constraints, 3) the

timing of lives, and 4) linked or interdependent lives – the embeddedness of individual lives in a matrix of social relationships over time. First, historical time may produce cohort effects when typical influential experiences are shared at the same point in the life course and have consistently impacted a birth cohort (Alwin & McCammon, 2003). Different cohorts would be affected by the same historical events in different ways. For example, Elder (1974) found that young children of the economic downturn in the 1920's and 30's were more seriously affected by family hardship than other cohort groups such as those in middle childhood and late adolescence in the Great Depression.

In addition, ethnicity and race are commonly indicated in examining the effects of historical time and place, and the extent of human agency on different aspects of linked lives. Phua and Kaufman (2008) found that the timing of immigration and ethnicity affect patterns of grandparent caregiving. Also, culture is a common indicator in examining a specific place in time (Gieryn 2000).

Emphasis on human agency in life course perspective has been greatly assisted by Bandura. In introducing the concepts of self-efficacy and efficacy expectation, he proposed that humans are agentic, which means they are capable of intentionally influencing their own functioning and life circumstances (Bandura, 2006). However, human agency has limits. An individual's choices are constrained by the structural and cultural understanding of a specified historical era. Hilton and Elder (2007) suggested that there are both biological and social structural limits to agency. They point out that greater personal control contributes to better health among older adults, but that agency declines across the life course due to decreasing physical functioning and increasing social constraints. Clausen (1995) presents a succinct

description of the principle of human agency; individuals construct their own life course through choices and actions within the opportunities and constraints of history and social circumstances.

The fourth principle of life course perspective, 'linked lives,' claims that individuals' lives are interrelated and highlights the "notion of interdependence and the idea that human lives are embedded in social relationships with kin and across the lifespan" (Elder, 1994, p.6). This conception of linked or independent lives moves understandings from "a consideration of the social or the individual to experiences expressed through networks of shared relationships" (Elder, 1998, p.4). This principle takes into account grandparents' residence status, such as grandparent-headed householders and co-residence with their grandchildren and adult children (Yoon, 2005).

Elder (1998) and Shanahan (2000) have identified two other concepts related to life course perspective: diversity in life course trajectories and developmental risk and protection. The major theme of diversity in life course trajectories indicates that there is much diversity in life course pathways as a result of cohort variations, social class, culture, gender, and individual agency. For example, people may immigrate as a result of social, religious, or political persecution, or for economic reasons. Since the settlement experience demands establishment of a new social network, changes in socioeconomic status and adjustments to a new physical and social environment are inevitable. Developmental risk and protection means that experiences with one life transition or life event have an impact on subsequent transitions and events and may either protect the life course trajectory or put it at risk. A focus on transitions and trajectories offers the possibility of introducing "normative and non-normative changes that individuals experience over time' in the social and cultural context" (George, 1993, p.353). Thus, this perspective pays attention to heterogeneity and the possibility of heterogeneous patterns across

time and place (Elder, 1994).

The life course perspective recognizes an individual's life transition as relating to family transition; in the context of this present study, changes in the individual's life from the grandparent to the caregiver represent changes in the family structure. Extending life longevity has led to a remarkable increase in the availability of intergenerational families and an extended period for supportive exchanges across the life course (Putney & Bengtson, 2003). Yet, at the same time, many multigenerational households report more family legal and financial problems because they are more likely to report changes in family composition due to marriage, divorce, job loss, or other circumstances (Musil et al., 2013). These changes may complicate interpersonal relationships, or contribute to negative health outcomes among grandparent caregivers (Hayslip & Kaminski, 2005). Further, the life course perspective may be helpful to address how socioeconomic status affects the well-being of grandparents and the use of support systems since it describes different lifespan among individuals with different backgrounds.

2.3 CONVOY MODEL

Role theory is fitted in research on a grandparent caregiver's social relations. As Burnette (1999) claims, role theory plays a pivotal role in explaining role transition in later life, or the acquisition and loss of roles and the impact of such transitions on individuals' social integration and perception of well-being. While role theory brings in personal characteristics, the life course perspective allows the inclusion of situational characteristics in the convoy model. Situational characteristics include the groups and organizations to which individuals belong, as well as the

demands and expectations of the roles they occupy, which are critically important for understanding the contextual experience of the individual.

These situational characteristics reflect the basic tenets of the life course perspective incorporating the importance of organizational and historical contexts, group, or cohort perspective (Antonucci et al., 2010). Also, these factors fundamentally influence the demands and expectations experienced by the individual that may change throughout the life span; thus, family role transition is conceptually grounded in life course perspective. According to Bengtson and Allen (2009), the life course perspective focuses on “age-differentiated” sequences of transitions and the manner in which social and historical contexts configure lives. This perspective allows for the examination of transitions in the context of interacting timetables on the life course trajectory (Burton, 1996).

The convoy model of social relations further postulates that each individual is surrounded by a convoy, a set of people with whom the individual maintains reciprocal emotional and instrumental support. Hayslip et al. (2014) suggest that the provision of reliable emotional and instrumental support from friends and family is a key component in efforts to improve the health of grandparent caregivers.

Moreover, the convoy model suggests that each of the specific aspects of social relations—that is, social network, social support, and the quality of social relations—influences both how much stress the person will experience and how negatively or positively they will be affected by the stress (Antonucci et al., 2010). For example, the parent-child relationship is one of the most central relationships in one’s lifetime. Although certain types of support may never be exchanged, life trajectories show that the potentiality and unconditional nature of support remain important features of this relationship and represent a form of security in the intergenerational

relationship (Kemp, 2005). Support change, therefore, should be a focus of intergenerational relationships, with increasing life longevity and length of parent/child roles.

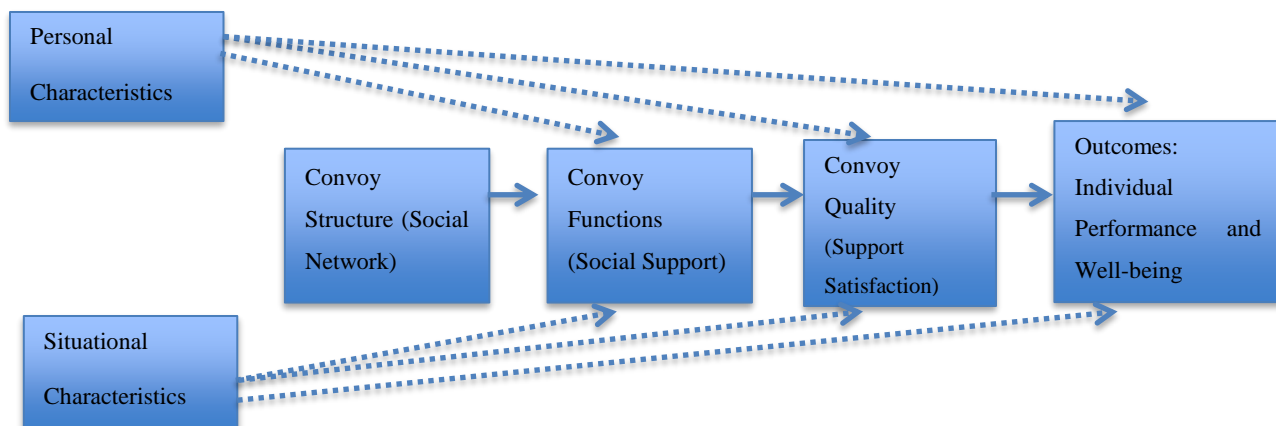
Also, grandparent caregivers experience role confusion and role stress linked to their parenting skills (Smith et al., 2008). Those caregivers are viewed as less efficacious parents by non-caregiving age peers, further contributing to the stigma and isolation which exacerbates the stress (Hayslip & Glover, 2008). In such cases, the caregivers' convoy may influence their health. As one's convoy often shrinks with increased age (Antonucci, 2001), the quality of social support is importantly related to grandparents' social isolation (Wohl et al., 2003).

In sum, the convoy model provides a broad perspective of the development of social relations over the life course. The model suggests that relationship quality varies within individuals over time, and that trajectories of relationship quality differ by relationship type, such as spouse, friend, or neighbor (Mejia & Hooker, 2013). In particular, grandparent caregivers experience social relation changes during their caregiving role transition. The convoy model allows examination of how grandparent caregivers' well-being is influenced by changes and continuity of various social relations.

As mentioned above, role theory can be used when focusing on a grandparent caregiver's social relations. As Burnette (1999) claims, role theory plays a pivotal role in explaining role transition in later life, or the acquisition and loss of roles and the impact of such transitions on individuals' social integration and perception of well-being. Roles may be ascribed, developed, and achieved through social interaction. The convoy model extends role theory, viewing social relations not as simple singular events but rather as linked interactions that accumulate and develop over time.

Accordingly, the convoy model assimilates social network structure and relationship processes and changes over time. Relationships vary in their closeness, their quality (e.g., positive, negative), their function (e.g., aid, affect, affirmation exchanges), and their structure (e.g., size, composition, contact frequency, geographic proximity) (Antonucci et al, 2010). The composition and quality of the network is shaped over time by factors that are personal (age, gender, and personality) and situational (role expectations, resources, and demands) (Antonucci et al., 2010). These factors are not always sequenced at the same time and they also influence the individual's health and well-being (see Figure 1).

Figure 1. Effects of Convoy Properties



Source: Antonucci et al., 2010

The umbrella term “social relations” includes multiple dimensions, often categorized as network structure, social support, and support quality. Each of these may influence health in unique ways (Antonucci, 1995). Grandparent caregiver households have led to “diversified

social networks, characterized by household structures, extra household ties, and general patterns of helpful exchange” (Pelto, Roman, & Liriano, 1982, p.54). Research has used various methodological ways to find patterns of social network and social support.

Researchers have operationalized and measured social relations using a variety of factors, such as the number of people, degree of community involvement, participation in social group etc. Uchino (2006) suggested that complex measures better represent the multiple influences of social relations with increased psychometric reliability and validity. One study posits that structural aspects are more predictive of mortality than functional aspects (Holt-Lunstad et al., 2012). That is, the density and frequency of social interactions better predict survival than the degree of social interactions because people’s perceptions of relations are impacted by so many factors (i.e., social skills, egotism). On the contrary, Friedman et al. (1995) claimed that quality of social relations should be considered because negative relations have been linked to greater mortality. Overall, while many studies of mortality have utilized single item measure of social relations, the magnitude of association was used frequently among those studies utilizing complex or multidimensional assessments (Uchino, 2006; Penninx et al., 1997).

2.4 PATHWAYS OF THE EFFECTS OF SOCIAL RELATIONS ON MORTALITY RISK- THE BERKMAN MODEL

Berkman et al. (2000) presented a broad conceptual model of how social networks may impact health (see Appendix A). According to this model, social relations positively influence health in several ways through psychological, behavioral, and physiological processes. The authors use the term ‘upstream forces’ in a larger social and cultural context, which are seen to condition

network structure. Upstream forces refer to the macro factors that comprise social-structural influences on health and health systems, and the social, physical, economic and environmental factors that determine health (RAND, 2015). The model moves downstream to understand the influences of network structure and function. The mezzo level in Berkman's model is the structure of social networks and interaction between members of social networks. The micro level in the model includes the ways in which social networks may function through the provision of opportunities for social support and engagement in social activity (Giles, 2007). To sum up, this paradigm claims a cascading casual process, where macro-social framing forces influence social network structure and interaction, which in turn, set psychosocial mechanisms into motion (Litwin, 2007).

Analysis of the effect of social relations on mortality requires taking into account several factors that are associated with health outcomes that may lead to death. Most of all, socio-demographic variables related to greater propensities for death should be controlled. The variables known to be associated with late life mortality are age (Bath, 2003), gender, and socio-economic status (Cooper, 2002). Particularly, Ahmad and Bath (2005) confirmed that age was the most important factor of mortality among older adults who resided in the community.

The effects of psychobiological pathways also should be considered in the analysis of the effect of social network on mortality. The first pathway in the Berkman model is the health behavioral pathway, which includes health promotion and/or risk behaviors. Health promoting behavior, such as regular physical activity, is positively related to health and inversely related to mortality (Landi et al., 2010). Risk behaviors, on the other hand, are negatively associated with health and positively associated with mortality; for example, smoking and drinking alcohol increase mortality risk (Janssen & Kunst, 2005). The second pathway involves psychological

factors such as emotional state, an example of which is depression. However, the literature on the effect of depression on mortality is mixed. For example, Cuijpers and Smit (2002) found an increased risk of mortality with depression while Ben-Ezra and Shmotkin (2006) found no association between depression and mortality after controlling self-rated health. Lastly, the third pathway of the Berkman model is the physiologic one, which includes morbidity or major illness. Morbidity or major illness has been found to independently increase mortality risk in later-life, in particular, cases of cancer, diabetes, heart attack and stroke (Schupf et al., 2005; van den Brink et al., 2005). In sum, the convoy model provides a broad perspective of the development of social relations, and how the structure of a social network influences health via psychological, behavioral, and physiological pathways, making it useful to examine the situation of grandparent caregivers.

Some studies have found that quality of relationships is more protective of health outcomes, including mortality and physical and mental health, than quantity of relationships (Antonucci, Fuhrer, & Dartigues, 1997). However, it is necessary to have some quantity of relations in order to have high quality relations. Since the process by which social relations influence risk for mortality may be less obvious and more complex than other well-recognized health risk factors (Holt-Lunstad & Smith, 2012), the convoy model may help explain more comprehensive characteristics of social relations among grandparent caregivers.

3.0 LITERATURE REVIEW

3.1 DIRECT EFFECTS OF CAREGIVING STATUS ON HEALTH

Although most studies have focused on the detrimental health outcomes of providing childcare for grandchildren, some studies have found that grandparenting has beneficial effects on a grandparent's health outcomes. For example, grandparenting has been shown to have a positive effect on grandparents' cognitive functioning (Arpino & Bordone, 2014), subjective well-being (Mahne & Huxhold, 2015), and risk of depression (Grundy et al., 2012). Caregiving hours is related to a state of well-being. One study also showed some benefits for grandparents who babysit grandchildren (Hughes, Waite, LaPierre, & Luo, 2007). Occasional babysitting by grandparents is often known to give adult children temporary relief and may ease the burden on an employed young mother (Presser, 1989). Interestingly, recent studies suggest that grandparents with higher levels of education, income, and assets are more likely to provide babysitting (Luo et al., 2012).

As mentioned above, some studies have found that having a few caregiving hours a week is related to reduced mortality risk (Burns et al., 2016; Hillbrand et al., 2017). Hillbrand et al. (2017) found that older adults who provided non-custodial care for grandchildren had a lower risk of death over a 20-year period than those who did not care for their grandchildren, using data from the Berlin Aging Study for over 500 older adults aged 70 and over. However, high levels of caregiving are associated with negative health outcomes (Minkler & Fuller-Thomson, 2001). Jang and Tang (2016) examined the effects of caregiving hours and reported that those who spent more time caregiving showed higher depressive symptoms than caregivers those who spent

fewer hours.

3.2 EFFECTS OF SOCIAL RELATIONS ON HEALTH AND MORTALITY

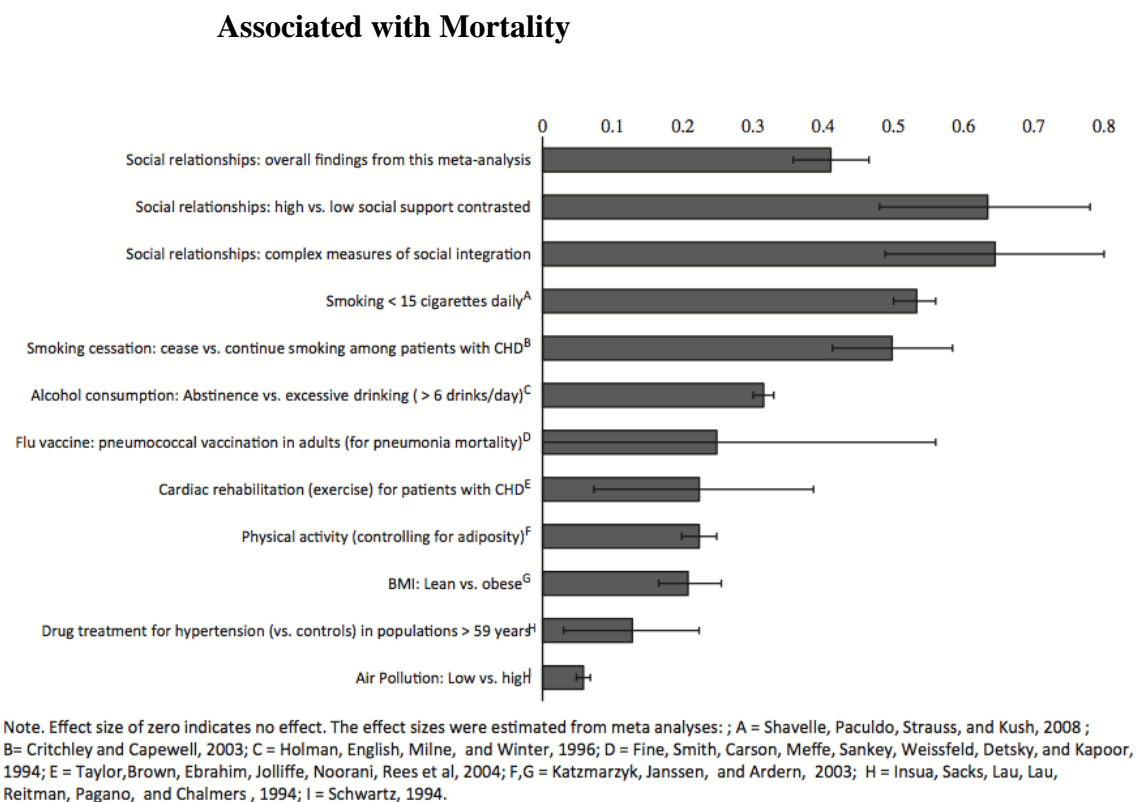
Five decades ago, one study reviewed five large prospective studies including a total sample of 4,775 adults in Alameda County, California, between ages 30 and 69, and found that there was an association between social relations and mortality (Berkman & Syme, 1979). Soon after, numerous studies were conducted with participants across entire adult life-span (House, Robbins, & Metzner, 1982; Schoenbach, Kaplan, Fredman, & Kleinbaum, 1986).

Holt-Lunstad, Smith, & Layton (2010) searched major databases (e.g., PsycInfo, Medline) for all prospective studies (1900-2007) addressing to what extent social relations influence the risk of mortality. The authors reviewed 148 studies including 308,849 participants followed for an average of 7.5 years; most were healthy, but 23 percent had received outpatient medical treatment, and 16 percent had experienced inpatient medical settings. They found that individuals' experiences within social relations significantly predicted risk for mortality, with results showing 50 percent increased likelihood of survival for participants with stronger social relations compared to those with weaker social relations.

Most studies examining the association between social relations and mortality were epidemiological studies, which typically tracked initially healthy participants over a long period of time (Holt-Lunstad & Smith, 2012). People with strong social relationships were 50 percent more likely to be alive at the follow-up evaluation, regardless of initial health status. Clinically ill participants were shown to utilize social support even more frequently than those who are in

relatively healthy. Holt-Lundstad and Smith (2012) compared the influence of social relations with that of other well-known mortality risk factors, such as smoking and excessive alcohol consumption. The authors found that the influence of social relations is equivalent to or greater than that of most leading health indicators, including physical activity, being overweight or obese, tobacco use, alcohol abuse, immunizations for influenza, and air pollution (see Figure 2).

Figure 2. Comparison of Odds of Decreased Mortality across Several Conditions



Source: Holt-Lundstad & Smith, 2012

Berkman and Syme (1979) assessed the presence or extent of four types of social ties: marriage contacts with extended family, contacts with friends, ties with other formal, and ties with informal group affiliations. The authors demonstrated that those who were low on the

Social Network Index (SNI), based on a weighted sum of indicators of marital status, contacts with close friends and relatives, church membership etc., were at higher risk of death than those with a higher SNI. However, this study provided little insight as to which aspects of social relations protected against death.

SNI was also a significant predictor of mortality after controlling for variables of physical health, socioeconomic status, smoking, alcohol consumption, physical activity, obesity, and use of preventive health services (Hause, Laindis, & Umberson, 1988). Significant protective effects of group membership were found in men and of church attendance for women. Since then, a number of studies of mortality have examined relationships of mortality with various measures of social relations. Although social relations have received much attention in the research, it is not easy to examine it as risk factors for mortality in biomedical areas (Holt-Lunstad, Smith, & Layton, 2010). This may be partially due to the fact that a great number of studies have showed a wide variation in using social relations and presented disappointing clinical trials (Holt-Lunstad et al., 2010). Schoenbach et al. (1986) conducted a study based on 2,059 participants aged 47 years or more in Georgia and found that SNI was associated with reduced risk of death during a twelve-year follow-up period. The results showed the strongest effects among the older white males aged 60 to 80. This study reported that the oldest participants with the fewest social ties were at elevated risk of mortality.

Studies examining the relationship of social relations and health outcomes have applied many different approaches. Many have examined health using specific variables, which is referred to as variable-centered approach; these included variables such as marital status, frequency of contact with family and friends, attendance at church, and participation in groups. Some researchers have created an index like the social network index, aggregating separate

variables into a composite or average measure to determine the “least” to “most” socially connected individuals (Berkman & Syme, 1979; House et al., 1982).

More recently, researchers have used a person-centered approach, creating social network typologies that represent a collection of an individuals’ social network attributes. Rather than seeking the influence of variables, the person-centered approach attempts to combine multiple social indicators into a meaningful typology in order to describe the characteristics of individuals’ networks. According to Fiori et al. (2006), these typologies reflect the complex, multidimensional, and aggregate nature of social life. For example, Litwin (2001) created five network typologies based on a sample of 2,079 Jewish people to examine social relationships in their complex and aggregate state by emphasizing multiple relationships and their functional specificity. The five social typologies were derived from the following variables to determine types of social networks: 1) current marital status, 2) number of proximate children, 3) frequency contact with children, 4) frequency contact with friends, 5) frequency contact with neighbors, 6) attendance at religious services, and 7) attendance at social clubs. The typologies, using those variables, can be labeled as the following: 1) a diverse network, in which the majority of members were married, had on average one child who lived in close proximity, had very frequent contact with children, friends, and neighbors, and attended the synagogue and organized group meetings at a moderate amount; 2) a friends network, which reflects a large number of friends and frequent attendance at organized meetings and attendance at religious services a moderate amount; 3) a neighbors network: there was a higher prevalence of widowhood and members reported frequent contact with adult children and neighbors but not friends; 4) a family network: members had an average of five children, and reported frequent contact with them and minimal social time with friends and neighbors, and 5) a restricted network: most members did

not have a spouse, less frequent contact with adult children, and very little contact with friends and neighbors.

Compared to restricted networks, diverse networks have been associated with more recent healthcare utilization (Litwin, 1998), fewer depressive symptoms (Fiori et al., 2006), higher levels of life satisfaction (Fiori et al., 2007) and increased probability of survival (Litwin & Shiovitz-Enra, 2006; Fiori et al., 2008). Litwin and Shoivitz-Enra (2006) found that network types were associated with mortality in the old age group (age 70 and more). Compared to individuals belonging to restricted networks, respondents located in diverse and friend-focused network types showed a lower risk of mortality.

Litwin (2001) found that respondents in diverse or friend networks reported the highest morale while those in family or restricted networks had the lowest. Fiori et al. (2006) categorized five types of social networks and also found diverse, family, and friends network types, which is consistent with the work by Litwin (2001). However, they found two types of restricted networks, rather than just one: a nonfamily network and a non-friend network. Depressive symptoms were highest for individuals in the non-friend network and lowest for individuals in the diverse network based on a sample of 1,669 older adults age 60 and over. These findings are consistent with the literature suggesting that friendships may be more influential than family relations on well-being (Adams & Blieszner, 1995). In general, more diverse, friend-focused networks are associated with better physical and emotional health, whereas restricted and family-focused networks are linked to poor physical and emotional health (Litwin 2011; Litwin & Shiovitz-Enza, 2006).

While there is consistent indication of a lower risk of mortality among people with a large social network, the mechanisms through which social support influences health are unclear

(Penninx et al., 1997). Penninx et al. (1997) extended the role of social support on mortality. The authors operationalized social support using structural, functional, and perceived aspects. Using Cox proportional hazards regression models during a follow-up of 29 months, they revealed that having fewer feelings of loneliness and greater feelings of mastery are directly associated with a reduced mortality risk when controlling for age, sex, chronic diseases, use of alcohol, smoking, and functional limitations. In addition, persons who received a moderate and high level of emotional support had reduced mortality risk when compared with persons who received a low level of emotional support. On the other hand, recipients of a high level of instrumental support were shown to have a higher risk of death.

Although social relations are viewed as uncertain variables to measure and defined as a construct in research, evidence seems to indicate that the quantity and/or quality of social relations are associated with mortality. Johnson and Barer (1992) reported in their study of people aged 85 or above in San Francisco that less than 10 percent of their sample had weekly contact with their siblings, and less than 30 percent had weekly contact with other relatives. The study indicated that reductions in social contacts should not be viewed merely as involuntary or passive because older adults may minimize their risks and maximize their well-being by increasing their quality of relations. Therefore, the influence of relation quality should be considered in the context in which the support occurs.

Traditionally, positive social support is associated with increased longevity. Some studies have found that a person who receives more emotional support from a spouse, a child, or network members survives longer (Blazer, 1982; Lyyra & Heikkinen, 2006). However, others have found that receiving greater emotional support is associated with increased mortality risk (Walter-Ginzburg, Blumstein, Chetrit, & Modan, 2002).

Negative relations have been also associated with mortality. In Birditt and Antonucci (2008), low levels of positive support and increasing levels of negative relation quality were associated with increased mortality. They examined the influence of relationship quality on mortality in situations of life threatening or serious illness. Interestingly, this study found that lower positive and higher negative quality of relations buffered the association between illness and mortality. Antonucci and colleagues (2010) also found that greater negative relations with children and friends were associated with improved survival.

3.3 MEDIATING EFFECTS OF SOCIAL RELATIONS ON HEALTH

In line with the stress and coping model, coping and social support are considered to be the primary mediators for handling stress, allowing some caregivers to manage better than others (Pearlin et al., 1990). Social support is one of the mediating variables that minimizes the negative outcomes of family caregivers (Thielemann & Conner, 2009). Social support for custodial grandparents is an important mediator in the stress process as social relations prevent the development of secondary stressors, such as constriction of social life, poor self-esteem, and loss of self, ultimately improving the caregiving experience for custodial grandparents (Robitaille, 2012). Social support resources, such as a large social network, frequent social contacts, and the ability to arrange for assistance from friends, can offset the adverse effects of caregiving stress on depression (Sorensen & Conwell, 2011). Similarly, grandparent caregivers relying on their social networks for support may mitigate the negative effect of health outcomes when they receive support.

Contrary to positive aspects of social support, a high degree of received functional support was found to function as a detriment to grandparents under conditions of high stress (Landry-Meyer et al., 2005). Minkler and Fuller-Thomson (2005) found that custodial grandparents were significantly more likely than non-caregiving grandparents to report functional limitations in each of 6 areas: mobility inside the house, completing daily household tasks, climbing stairs, walking 6 blocks, doing heavy tasks, and working for pay. These functional limitations are significantly associated with poor-rated health and short-term mortality (Idler & Kasl, 1991).

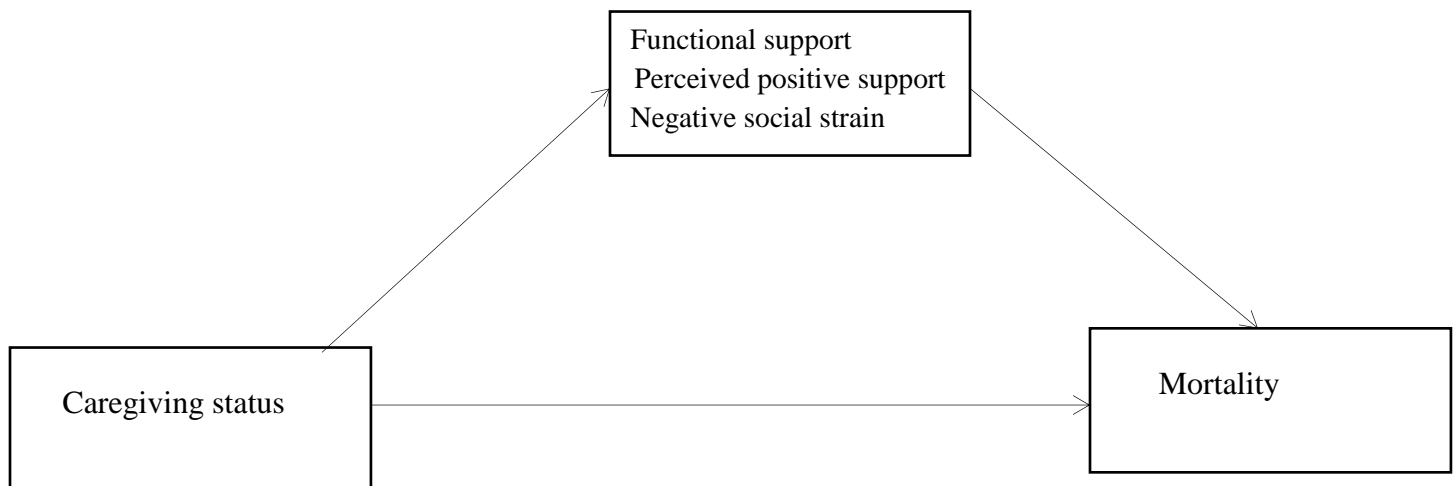
Hughes and colleagues (2007) provided evidence that grandmothers who started babysitting grandchildren or who continued to provide this care reported better self-rated health than grandmothers who provided no care. Specifically, they found that grandmothers who began providing 200 to 500 hours of care per year were more likely to exercise and reported fewer functional limitations. Hughes and Waite (2002) highlights that living in household structures where demands exceed resources may increase stress response, lead to poorer health behaviors, reduce the time available for self-care, and inhibit access to health care. As a result, these conditions increase the chances of illness and functional limitations and reduce the likelihood of health improvement.

3.4 THE PRESENT STUDY

Prior studies have suggested that social relationships influence one's well-being in later life. The present study proposes a developmental model for older adults' survival using various social relations as potential mediators linking grandparent caregiving and mortality (see Figure 3).

Another unique focus of this study is its attention to the concept of network typology. Although network typology has been examined as a significant predictor of health status, no studies have yet reported using it in an examination of the association of grandparent caregiving and mortality. The present study controls for chronic conditions, health promoting and risk behaviors, and depression which influence time to death as well as socio-economic characteristics. Further, while many studies have defined the caregiving status as permanent or non-permanent, this study included multiple caregiver status, including occasional babysitting caregivers, intermediate/extensive babysitting, custodial, and co-parenting caregivers.

Figure 3. A Conceptual Model for Grandparent Caregiving and Social Relations on Older Adults' Mortality Risk



3.5 RESEARCH QUESTIONS AND HYPOTHESES

R1. How does different caregiving status (occasional babysitting, intermediate/extensive babysitting, custodial, and co-parenting grandparent) relate to mortality risk?

H1. Babysitting grandparent caregivers live longer than intermediate/extensive babysitting, custodial, and co-parenting grandparent caregivers.

R2. Do social relations predict the relationship between caregiving status and mortality?

H2.1. Respondents with diverse and friend-focused networks have lower mortality than respondents with restricted and family-focused networks.

H2.2. Receiving functional support mediates the relationship between caregiving status and mortality.

H2.3. Perceived positive support mediates the relationship between caregiving status and mortality.

4.0 METHODS

4.1 DATA AND SAMPLE

In this chapter, I seek to examine the differential association of caregiving status and mortality. As potential mechanisms, social relations are examined through which caregiving status affects mortality risks. The data used were drawn from the Health and Retirement Study (HRS), which is a nationally representative longitudinal study of persons aged 50 and over. The HRS has been conducted by the Institute for Social Research Survey Center at the University of Michigan and funded by the National Institute on Aging, with additional funds provided by the Social Security Administration. The HRS consists of six birth cohorts who entered the study in different calendar years. Once respondents entered the study, they were interviewed every two years. According to HRS study design, a new birth cohort is added every six years to maintain a representative sample of the population.

Initial cohort response rates ranged from 70% to over 80% over waves; re-interview rates for all cohorts at each wave were between 92% and 95% (HRS, 2011). In 2006, data collection expanded to include questionnaires about psychosocial well-being and social context. Since 2006, participants have reported on personal evaluations of their life circumstances, subjective well-being, lifestyle and stress (Sonnega et al., 2014). In 2006, 50% of HRS respondents were randomly selected and invited for an enhanced face-to-face interview. In 2008, the remaining 50% of HRS respondents were invited for the enhanced face-to-face interview. Among the people who were interviewed, the response rate for the leave-behind questionnaire was 90%. As HRS 2006 included a very small number of custodial/co-parent grandparent caregivers (less than

two percent of the total sample size), this study uses HRS 2008 as the baseline time (T1). This study also uses death points until 2014 (T2), which is tracked by HRS tracker files providing the most recent death years for the analysis. The latest update on mortality in 2014 reported that, of the initial 1,129 caregiver respondents, 131 (13%) had died.

The HRS sample consists of non-institutionalized adults living in the US. Since this study is focused on older adults' morality, the study sample was limited to older adults age 55 and over, as grandparent caregivers are defined. This study limits the sample to those who had complete information on the leave-behind questionnaire.

4.2 MEASUREMENT OF VARIABELS

4.2.1 Independent Variables

The main independent variables include caregiving status, structural social network, functional social support, and quality of social support. All independent variables were measured in 2006 for the analysis.

Caregiving status

HRS asked about caregiving status "Did you spend 100 or more hours in the last two years taking care of grandchildren?" If respondents answered "yes," they were further asked how many hours they spent on grandchild care as well as whether they lived with their grandchildren. The grandparent caregiving category was separated into four categories according to caregiving hours reported (Fuller-Tomson & Minkler, 2001).

These include: 1) occasional babysitting (less than 10 hours per week), 2) intermediate/extensive babysitting (10 hours or more than 10 hours per week), 3) co-parent (living with at least one adult child), and 4) custodial grandparents. For this study, if grandparents lived with their grandchildren, they are regarded as custodial/co-parenting grandparents; however, if they also lived with at least one adult child, they are coded as co-parenting.

4.2.2 Mediators

Structural social network

Guided by previous literature (Fiori et al., 2006; Kim, Fredriksen-Goldsen, Bryan, & Muraco, 2017), this study used the following variables: 1) marital status – married (1) or not married (widowed, divorced, separated, or never married) (0), 2) total number of close children, 3) close relatives, 4) frequency of contact with children, 5) contact with friends, 6) attendance at religious services, and 7) attendance at organized group meetings. The number of close children or relatives was rescaled due to the uneven distribution and skewness: 0=none; 1= one; 2= two; 3= three or four; 4= five through eight; 5= nine or more. Frequency of contact with children or friends was assessed using answers to three questions asking how often the participants met up, spoke on the phone, and/or wrote to or emailed with their children or friends on a scale from 1 (less than once a year or never) to 6 (three or more times a week). Attendance at religious services was assessed on a scale from 1 (not at all) to 5 (more than once a week). Attendance at organized meetings was measured using two questions: “how often do you go to a sport, social, or other club?” and “how often do you attend meetings of non-religious organizations, such as political, community, or other interest groups?”, with responses on a scale of 1 (not in the last month) to 6 (daily). Latent class analysis (LCA) was used in order to identify homogeneous

groupings within the study population after updating iteratively (Litwin & Shivovitz-Ezra, 2006).

Use of these seven indicator variables yielded four latent network types at baseline (i.e., friends, diverse, family, and restricted/non-friends).

Table 1. Variables Included in the Analysis Models and Their Measurement

Variable name	Label	Measures
Age	Respondent's age in 2008	Continuous variable (55-90)
Gender	Respondent's gender in 2008	1. Male 2. Female
Income	Total household income	1. Less than \$25,000 2. \$25,000 and over
Education	Highest educational level	1. High school graduate or less 2. Some college graduate or more
Working	Current working status	0. No 1. Yes
Number of chronic conditions	Number of chronic conditions: Hypertension (high blood pressure), diabetes mellitus, cancer, chronic lung disease, coronary heart disease, stroke, arthritis, and psychiatric problems (in general, except for depression)	1. 0 2. 1-2 3. 3-4 4. 5 or more
Smoking	Do you smoke cigarettes now?	0. No 1. Yes
Drinking alcohol	How many days do you drink alcohol per week?	0. No 1. One day or more
Exercise	How often do you take part in sports or activities?	0. Less than once a week 1. Once a week or more
Depression	2008 CESD	Sum of eight items (0-8)
Self-rated health	Self-rated health	5- point scale (1. poor, 2. fair, 3. good, 4. very good, and 5. excellent)
Social Network		
Marital status	2008 marital status	0. Separated/divorced/widowed/never-married

Number of children	Count of kids- not their spouses	1. Married
Frequency of contact with children/ friends	<ol style="list-style-type: none"> 1. Meet up with children 2. Speak on the phone 3. Write or email 	Continuous variable <ol style="list-style-type: none"> 1. Less than once a year or never 2. Once or twice a year 3. Every few months 4. Once or twice a month 5. Once or twice a week 6. Three or more times a week
Attendance at religious services	How often attend religious services	<ol style="list-style-type: none"> 1. Not at all 2. One or more times a year 3. Two or three times a month 4. Once a week 5. More than once a week
Attendance of organized group meetings	<ol style="list-style-type: none"> 1. How often go to a sport, social, or other club? 2. How often attend non-religious organization meetings, such as political, community, or other interest group? 	<ol style="list-style-type: none"> 1. Not in the last month 2. At least once a month 3. Several times a month 4. Once a week 5. Several times a week 6. Daily
Receiving Functional Social Support	Does anyone ever help you manage money/ prepare meals/ shop for groceries/ make phone calls/ take medications?	<ol style="list-style-type: none"> 0. No 1. Yes
Support Quality Perceived positive support	Sum of the scores from children, other family, and friends <ol style="list-style-type: none"> 1. How much do you really understand the way you feel about things? 2. How much can you rely on them if you have a serious problem? 3. How much can you open up to them if you need to talk about your worries? 	<ol style="list-style-type: none"> 1. Not at all 2. A little 3. Some 4. A lot
Negative social strain	Sum of the scores from children, other family, and friends	<ol style="list-style-type: none"> 1. Not at all 2. A little

	1. How often do they make too many demands on you? 2. How much do they criticize you? 3. How much do they let you down when you are counting on them? 4. How much do they get on your nerves?	3. Some 4. A lot
Caregiving status	Types of caregiver status by caregiving hours or residing with grandchildren	1. Occasional babysitting 2. Intermediate/extensive babysitting 3. Custodial grandparents 4. Co-parenting grandparents

Functional Social Support

This is measured by receiving support for IADL (Instrumental activities of daily living), and the measure focuses on instrumental aspects of social support. Because caregivers are assumed to function well, functional social support for activities of daily living was excluded. The HRS includes items asking participants about five IADLs (using the phone, preparing meals, grocery shopping, managing money, managing medications). In order to reduce uneven distribution and skewness, this variable was dichotomized: 1=yes, receiving support for one or more IADLs, 0=no.

Relationship quality (Perceived social support)

Participants rated the positive and negative aspects of their relationships with their spouse/partner, children, and friends. Participants rated their relationships from 1 (not at all) to 4 (a lot). Positive relationship quality included three items: (relationship) understanding the way you feel; relying on them if you have a serious problem; opening up to them if you need to talk

about your worries. Negative relationship quality included four items: they make too many demands on you; they criticize you; they let you down when you are counting on them; they get on your nerves. An index of positive social support and an index of negative social support were created by averaging the summed scores.

4.2.3 Dependent Variable

Mortality

The primary dependent variable of the first analysis was mortality rate. Mortality is driven from the HRS linkages to the National Death Index (NDI). The HRS has created linkages to the NDI following each wave since the 2000 wave. After every linkage, the public release file is updated with the match status, month of death, and year of death for verified matches with the NDI database (HRS, 2011). Time to death represents mortality in this study. The months of death were released in a tracking file. HRS tracking studies indicated a 98.8% validation of deaths (HRS, 2011). This variable is measured by examining how many months participants lived between Time 1 interview (2008) and Time 2 (2014) ($M = 81.37$, $SD = 14.41$; Range: 8-86). Surviving participants were right censored. For multiple mediation analysis, participants were recoded as '1' if they had died or '0' if still living.

4.2.4 Covariates

Socio-demographic characteristics, including age (years), gender (1=male; 2=female), income (1=less than \$25,000; 2=\$25,000 and over), working status (0=non-working; 1=working) and education (1=high school graduate or less; 2=some college or more) were recoded and included

as covariates due to their documented association with mortality (House, 2002). Following the Berkman model, chronic conditions, smoking, drinking alcohol, exercise, self-rated health and depression scores were controlled. The HRS asked respondents about lifetime histories of a modest number of illnesses and conditions that are very important to older adults and account for much of the morbidity and mortality among older adults (Fisher et al., 2005). These conditions include; hypertension (high blood pressure), diabetes mellitus, cancer, chronic lung disease, coronary heart disease, stroke, arthritis, and psychiatric problems (in general, except depression). Chronic conditions were included to test objective health. The total number of diagnosed conditions was categorized as 0 (0), 1 (1-2), 2 (3-4), and 3 (5 or more). Chronic conditions are highly associated with the mortality rate (Antonucci et al., 2010). Smoking was coded as 1 for yes or 0 for no. Drinking alcohol was recoded as drinking alcohol once a week or more (1), or no alcohol consumption (0). Exercise was recoded as once a week or more (1), or less than once a week (0). Race was excluded from the analyses because race is not associated with mortality (Antonucci et al., 2010).

4.3 STATISTICAL ANALYSIS OF MORTALITY

This section provides a detailed description of the analyses to test the aforementioned research questions. Initially, a descriptive analysis of the demographic characteristics was conducted to ascertain sample characteristics both demographically and with regard to social relations. Next, a Cox proportional hazards models was processed. Variables with skewed distributions were logarithmically transformed.

Missing Data

Missing data are expected to be minimal for most variables. If missing data make a biased sample, it threatens valid inferences regarding the population from which the sample was drawn. However, this is a common problem in longitudinal data analysis, resulting in limitations regarding generalization of the findings as well as reduced power (Rubin, 1993). A multiple imputation approach is recognized as a preferred technique for completing missing data (Little & Rubin, 2002). The multiple imputation approach was performed by creating a small number of independent data sets that have missing values imputed.

LCA was performed without imputing missing values in the seven indicators because LCA is not supported for analyzing multiple imputed datasets. Instead, missing data in one of the indicators was handled with a full-information maximum likelihood (FIML) technique, assuming MAR (Lanza, Dziak, Huang, Wagner, Collins & Lanza, 2015). Social relation variables included a number of missing values (see Table 2). Due to reduction of the sample size, each social relation model was built with multiple imputations. The missing rates of perceived positive support and negative strain were 18 percent and 13 percent, respectively. Several variables related to health behaviors showed missingness: smoking (13%), drinking alcohol (13%), and exercise (14%) (see Table 6). Table 6 shows all missing values by each variable.

In this study, twenty datasets with no missing data were created due to high rates of missingness in social support quality variables, and statistical analyses were applied to each imputed dataset. Then the results were combined to produce estimates and a confidence interval (Rubin, 1987). Both univariate and bivariate analyses were performed using STATA 15.1.

Descriptive analyses

Univariate and bivariate analyses were conducted to describe the study sample and to evaluate the difference in characteristics between grandparenting caregivers. The differences between the four groups were evaluated using ANOVA for continuous measures and chi-square tests for categorical measures. Results are displayed in Table 2. Table 3 shows sample selectivity in detail by comparing participants who were still alive in 2014 with those who had died. Independent sample t-tests, Mann-Whitney U-tests, and Chi-squared tests were conducted for comparison. Univariate and bivariate results, along with analysis of the unadjusted association of each variable with mortality risk are shown in Table 3. The results of analyses helped to identify covariates to be included in the main analysis and an additional survival analysis in order to discover all potential confounders with Kaplan-Meier curves for all categorical variables. This provides insight into the survival function for each group by giving an idea of whether the groups are proportional (i.e., the survival functions are approximately parallel).

Cox Hazard Regression

Cox proportional hazard models are used to examine whether mortality varies as a function of network structure, social support, and positive and negative relationship quality. The Cox proportional hazards model (Cox, 1972) is the most commonly used model in the assessment of effects of explanatory variables on a censored response variable, such as survival (Therneau & Grambsch, 2000). Survival analysis is the most applicable statistical tool for analyzing time-to-event data because it can cope with censored data, as the event of interest may not always be observed. These right-censored cases cannot be handled correctly in the conventional OLS method.

When the survival analysis pursues modeling by determining the relationship between effective variables and prediction, a Cox proportional hazard model is used with parametric regression models (Lee & Wang, 2003). However, if the survival data analysis aims at describing the survival time without explaining the covariates, non-parametric methods, such as life tables and the Kaplan-Meier method are used (Veisi et al., 2017). The model specifies the hazard function $h_i(t; \mathbf{x}_i)$ for an individual i and the equation of the Cox regression model is as follows: $h(t) = h_0(t) \exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik})$, where $h_0(t)$ is the hazard function of time only, $\exp(\beta_1 x_{i1} + \beta_2 x_{i2} + \dots + \beta_k x_{ik})$ is the proportional hazard, and β_1 represents the regression parameters (Veisi et al., 2017).

After testing Cox proportional hazards assumptions, I added predictors in blocks of conceptually related variables in order to identify whether one or more variables within each block uniquely and independently predicted mortality. Model 1 included caregiving status and socio-demographic covariates in 2008, and the next three models sequentially added social network typologies, functional support and support quality, and health variables. These additive models were used to help examine the extent to which the effects of grandparenting on mortality risks are explained by social relations. To test whether the estimated impact of caregiving status and social relations were sensitive to the violation of the proportional hazard assumption, the multivariate Cox model was re-estimated by including interaction terms between the predictors and a function of survival time.

Mediation Model.

To answer Research Question 2.2 regarding the role of the social relations in explaining the caregivers' mortality, Model 3 added variables of received functional support, perceived positive

support, and negative social strain, respectively, to Model 1. Model 4 added health pathways to control for the possible impact of health. The aim of these analyses was to quantify the changes in the hazard ratio of caregivers' mortality from Model 1 to each of the subsequent models. This statistical method was often used in previous studies employing Cox regression to investigate the influence of mediating variables (e.g., Koster et al., 2006; Moody-Ayers et al., 2005).

To examine if the diverse aspects of social relationships (i.e., received functional support, perceived positive support and negative social strain) mediate the association between caregiving status and mortality, multiple mediation analyses were performed (Preacher & Hayes, 2008). Mediating effects were computed using the product of the coefficients methods by Preacher and Hayes (2008).

5.0 RESULTS

5.1 ANALYSIS ON MORTALITY

Statistical procedures prior to the main analysis

Before performing the main analysis, I checked the Kaplan –Meier curves for all categorical predictors to see if the groups are proportional as potential candidates for the final model. This provides insight into the shape of the survival function for each group. Figure 4 shows how the survival distributions differ between caregiving groups. The survival probability appears to be higher in the occasional babysitting grandparent compared to other groups until 60 months. After 60 months, it appeared no difference between the intermediate/extensive babysitting group and occasional babysitting group. Also, the survival probability appeared to be lower in the custodial grandparent and co-parenting grandparent groups.

Also, I considered the tests of equality across strata to decide whether to include the predictors in the final model. For the categorical variables I used the log-rank test equality, which is a non-parametric test while for the continuous variables I used a univariate Cox proportional hazard regression which is a semi-parametric model. All predictors had a *p*-value of .25 or less and they are all included in the final model (see Table 2).

Figure 4. Survival Probabilities by Caregiving Status (Kaplan-Meier Survival Estimates)

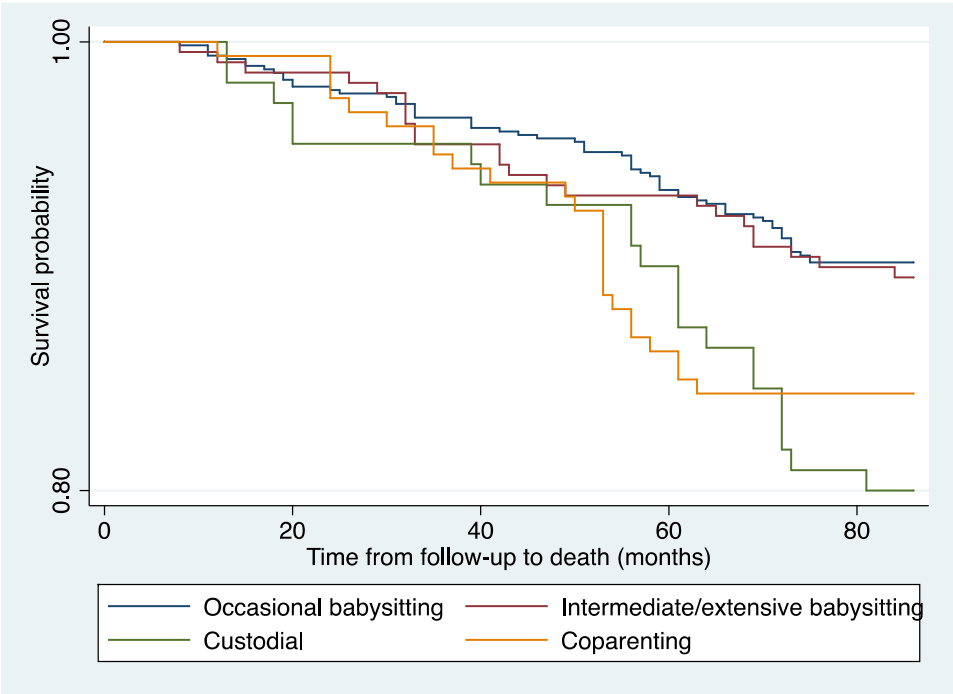


Table 2. Identification of Covariates for the Main Analysis

Variables	Time to death ^{a b}	Covariate
Caregiving status	$\chi^2 = 12.28^{**}$	yes
Social Network types	$\chi^2 = 7.69^{\dagger}$	yes
Functional Social Support	$z = 7.71^{***}$	yes
Perceived positive support	$z = -1.84^{\dagger}$	yes
Negative social strain	$z = 1.28$	yes
Age at T1	$z = 7.13^{***}$	yes
Female	$\chi^2 = 17.17^{***}$	yes
Income	$\chi^2 = 1.94$	yes
Education	$\chi^2 = 4.74^*$	yes
Smoking	$\chi^2 = 41.36^{***}$	yes
Exercise	$\chi^2 = 10.19^{**}$	yes

Note. ^a χ^2 values are given for categorical variables (log-rank test).

^b z values are given for continuous variables (*cox regression*).

Social network typology

In order to find the optimal number of clusters, I compared solutions ranging from a 2-cluster model through 7-cluster model using LCA. For the best selection of a model, I evaluated several model fit criteria, such as Akaike's Information Criterion (AIC, the Bayesian Information Criterion (BIC), entropy (an index of classification certainty with values closer to 1 indicating higher certainty), and the Lo-Mendell-Rubin likelihood ratio test (LMR-LRT). The optimal cluster selection can be achieved with low BIC values and high entropy (Lanza, Flaherty, & Collins, 2003). Table 3 indicates that the 4-cluster solution had the highest entropy and low BIC values. LMR-LRT also favored the 4-cluster solution, indicating that adding another class did not significantly improve model fit. Thus, I retained the 4-cluster solution.

Table 3. Fit Statistics for Latent Class Analysis (LCA) Solutions with 2-7 Clusters

Model	AIC	BIC	Entropy	LMR-LRT
2 classes	18535.209	18640.820	.630	$p < .001$
3 classes	18429.183	18575.027	.720	$p < .01$
4 classes	18303.688	18478.178	.725	$p = .025$
5 classes	18251.870	18481.764	.669	$p = .150$
6 classes	18215.012	18482.554	.568	$p = .470$
7 classes	18184.171	18490.945	.528	$p = .354$

Note. AIC= Akaike's Information Criterion (lower values indicate better fit),; BIC= Bayesian Information Criterion (lower values indicate better fit); LMR-LRT= Lo-Mendell-Rubin likelihood ratio test (significance indicates better fit compared with a solution with one fewer cluster).

Table 4 presents the profiles of the 4-cluster LCA solution. Numbers in brackets indicated the results of pairwise comparisons between clusters on each indicator. Cluster 1 (19.93%) was labeled “restricted network type.” People in this cluster had low numbers of close children and family, and low contact frequencies with children and friends. Moreover, they showed low attendance at religious meetings and organized group meetings. Cluster 3 (7.62%) was labeled “diverse network type.” This group was characterized by high numbers and frequent contact with close family and friends. This group also maintained highest attendance at religious meetings and organized meetings.

The friend-focused group (cluster 2, 21.52%), had high frequency of contact with friends but fewer numbers of close children and family compared with the diverse network type. With 51.93% of the sample, the family-focused group (cluster 4) was the largest. This group was characterized by greater numbers of close children and family and frequent contact with them.

Sample Selectivity

I explored sample selectivity in detail by comparing participants who were still alive in 2014 with those who had died (see Table 5). Participants who were still alive in 2014 were significantly more often occasional babysitting grandparents than custodial and co-parenting grandparents, were more likely to be female, had better health status and education, and had more healthy behaviors. Also, they were less likely to be characterized as the family-focused group and receive less functional social support.

Table 4. Profiles of Social Network Types (N=1,129)

Indicator	Total	Social Network Types				Statistics
		Cluster 1: Restricted/non friends	Cluster 2: Friends	Cluster 3: Diverse	Cluster 4: Family	
Married (%)	62.80	58.67	69.14	62.79	62.84	$\chi^2 = 6.40^\dagger$
Number of close children	2.32	1.60	2.14	2.29	2.81	$F = 91.41^{***}$
Number of close other family	2.53	1.34	1.49	2.60	3.74	$F = 480.78^{***}$
Contact with children	4.08	3.20	4.85	4.16	4.08	$F = 163.85^{***}$
Contact with friends	3.72	2.86	4.34	4.15	3.71	$F = 95.03^{***}$
Religious services attendance	3.07	2.65	3.10	3.44	3.17	$F = 9.23^{***}$
Meetings attendance	1.38	1.06	1.16	3.87	1.15	$F = 955.37^{***}$
N (%)		225 (19.93%)	243 (21.52%)	86 (7.62%)	575 (50.93%)	

Note: The highest mean value is presented in bold for each cluster indicator. $^\dagger < .10$, $* < .05$, $** < .01$, $*** < .001$.

Table 5. Comparison of Living and Deceased Participants in 2014 (N=1,129)

	Living participants (n=995)		Deceased participants (n=134)		<i>p</i> -values
	<i>M(SD)/n(%)</i>	Range	<i>M(SD)/n(%)</i>	Range	
Occasional babysitting grandparents	581 (58.39%)	—	64 (47.76%)	—	<i>p</i> =.020
Intermediate/ extensive babysitting grandparents	194 (19.50%)	—	23 (17.16%)	—	<i>p</i> =.520
Custodial grandparents	87 (8.74%)	—	22 (16.42%)	—	<i>p</i> =.005
Co-parenting grandparents	133 (13.37%)	—	25 (18.66%)	—	<i>p</i> =.098
Female	635 (63.82%)	—	61 (45.52%)	—	<i>p</i> =.000
Income	660 (75.09%)	—	75 (69.44%)	—	<i>p</i> =.205
Health	3.24 (.04)	1-5	2.73 (.11)	1-5	<i>p</i> =.000
Education	299 (30.05%)	—	28 (20.90%)	—	<i>p</i> =.028
Depressive symptoms	1.36 (1.95)	0-8	1.79 (1.82)	0-7	<i>p</i> =.000
Smoking	120 (13.73%)	—	30 (27.78%)	—	<i>p</i> =.000
Exercise	471 (54.51%)	—	43 (38.74%)	—	<i>p</i> =.002
Social Network					
Restricted, non-friends	204 (20.50%)	—	21 (15.67%)	—	<i>p</i> =.189
Friends	219 (22.01%)	—	24 (17.91%)	—	<i>p</i> =.278
Diverse	80 (8.04%)	—	6 (4.48%)	—	<i>p</i> =.144
Family-focused	492 (49.45)	—	83 (61.94)	—	<i>p</i> =.007

Functional Social Support	.21 (.58)	0-4	.72 (1.30)	0-5	$p = .000$
Support Quality					
Positive social support	2.96 (.67)	1-4	2.88 (.64)	2-4	$p = .267$
Negative social support	1.48 (.56)	1-3	1.56 (.69)	1-4	$p = .496$

Note: Results were reported prior to multiple imputations.

5.1.1 Descriptive Statistics

Table 6 presents descriptive statistics for the sample at baseline. There are 1,129 grandparent caregivers and the average age of the sample was 66.52 ($SD=7.10$). The average time to death after T1 was 81.37 ($SD=14.41$) months. About 62 percent were females ($n=696$) and 30 percent received more than some college education ($n=327$). About 12 percent of respondents ($n=150$) smoked and 43 percent ($n=416$) reported exercising once a week or more at baseline. Regarding caregiving status, 57 percent of respondents provided occasional babysitting ($n= 645$) and 19 percent provided intermediate/extensive babysitting ($n=217$) to their grandchildren. Custodial and co-parenting grandparents were 10% ($n=109$) and 14% ($n=158$), respectively.

With regard to social network type, over the half of the respondents (51%) were classified into the family-focused group and the least number of the respondents (8%, $n=86$) classified into the diverse group. The average functional social support scores were low at the average $M=0.27$ ($SD= .72$). Respondents reported they perceived positive support ($M= 2.95$, $SD= .66$) from their family and friends and perceived a relatively low level of negative support from their networks ($M=1.49$, $SD= .57$).

Group differences in characteristics potentially influencing mortality in grandparent caregivers are summarized in table 7. Custodial grandparents were older ($M=68.70$, $SD= 6.51$) than other groups. In co-parenting (63%) and custodial (64%) grandparents, the percentage of respondents with high income was significantly lower than that of occasional (79%) and intermediate/extensive (74%) babysitting grandparents. The proportion of participants with high education was significantly lower in the custodial and co-parenting grandparent groups than that

in the babysitting grandparents. Custodial and co-parenting grandparents were in worse physical and mental (depressive symptoms) health than both babysitting groups.

With regards to social network types, the custodial grandparents were least likely to be classified into the friend-focused group (9%). The custodial (62%) grandparents were more likely to be in family-focused group than the co-parenting (54%), occasional (48%) and intermediate/extensive (53%) babysitting grandparents. Also, custodial grandparents perceived significantly lower positive support from family and friends.

Table 6. Summary Statistics of Study Sample and Key Variables at Baseline (N=1,129)

Variables	n (%) / mean (SD)	Range	Missing n (%)
Time to death (months) after T1	81.37 (14.41)	8-86	0 (0)
Age at T1	66.52 (7.10)	55-90	0 (0)
Female	696 (61.65%)	0-1	0 (0)
Income (\$25,000 or more)	735 (74.47%)		142 (13%)
Education (Some college or more)	327 (28.96%)	--	0 (0)
Working	380 (39%)	--	142 (13%)
Depressive symptoms	1.40 (1.94)	0-8	44 (3%)
Smoking	150 (12.27%)	--	147 (13%)
Drinking alcohol	351 (35.63%)	--	144 (13%)
Exercise (Once a week or more)	416 (43.33%)	--	154 (14%)
Number of chronic conditions			3 (0)
0	118 (10.48%)	--	
1-2	569 (50.53%)	--	
3-4	359 (31.88%)	--	
5 or more	80 (7.10%)	--	
Caregiving status		1-4	0 (0)
Occasional babysitting	645 (57.13%)		
Intermediate/Extensive babysitting	217 (19.22%)		
Custodial	109 (9.65%)		
Co-parenting	158 (13.99%)		
Social Network		1-4	0 (0)
Restricted, non-friends	225 (19.93%)		
Friends	243 (21.52%)		
Diverse	86 (7.62%)		
Family-focused	575 (50.93%)		
Functional Social Support	.27 (.72)	0-5	0 (0)
Support Quality			

Perceived positive support	2.95 (.66)	1-4	199 (18%)
Negative social support	1.49 (.57)	1-4	152 (13%)

Note. Results were reported prior to multiple imputations.

Table 7. Descriptive Characteristics: Group Difference at Baseline (N=1,129)

	Occasional babysitting grandparents (n=645)		Intermediate/ extensive babysitting grandparents (n=217)		Custodial grandparents (n=109)		Co-parenting grandparents (n=158)		<i>p</i>
	<i>M(SD)/n(%)</i>	Range	<i>M(SD)/n(%)</i>	Range	<i>M(SD)/n(%)</i>	Range	<i>M(SD)/n(%)</i>	Range	
Time to death (Months) after T1	82.14 (13.42)	8-86	81.69 (14.36)	8-86	79.05 (16.92)	13-86	79.44 (15.81)	12-86	<i>p</i> =.055
Age at T1	66.40 (7.25)	55-89	66.61 (7.27)	55-86	68.70 (6.51)	56-90	65.40 (6.32)	55-82	<i>p</i> =.002
Female	381 (59.07)	—	137 (63.13)	—	71 (65.14)	—	107 (67.72)	—	<i>p</i> =.169
Income (\$25,000 or more)	445 (78.90)	—	145 (74.36)	—	60 (63.83)	—	85 (63.43)	—	<i>p</i> =.000
Education (Some college or more)	215 (33.33)	—	63 (29.03)	—	15 (13.76)	—	34 (21.52)	—	<i>p</i> =.000
Working	227 (40.25)	—	79 (40.51)	—	21 (22.34)	—	53 (39.55)	—	<i>p</i> =.009
Self-rated Health	3.35 (1.00)	1-5	3.26 (1.03)	1-5	2.64 (1.10)	1-5	2.77 (1.14)	1-5	<i>p</i> =.000
Depressive symptoms									
Smoking	74 (13.21)	—	19 (9.79)	—	29 (30.85)	—	28 (20.98)	—	<i>p</i> =.000
Drinking alcohol	230 (40.85)	—	66 (33.85)	—	19 (20.21)	—	36 (27.07)	—	<i>p</i> =.000
Exercise (Once a week or more)	307 (53.77)	—	93 (49.47)	—	53 (58.89)	—	61 (48.41)	—	<i>p</i> =.339
Number of chronic									<i>p</i> =.000

conditions									
0	79 (12.25)	—	20 (9.35)	—	4 (3.67)	—	15 (9.49)	—	
1-2	345 (53.49)	—	114 (53.27)	—	45 (41.28)	—	65 (41.14)	—	
3-4	192 (29.77)	—	69 (32.24)	—	40 (36.70)	—	58 (36.71)	—	
5 or more	29 (4.50)	—	11 (5.14)	—	20 (18.35)	—	20 (12.66)	—	
Social Network									
Restricted, non-friends	124 (19.22)	—	36 (16.59)	—	27 (24.77)	—	38 (24.05)	—	$p = .173$
Friends	157 (24.34)	—	54 (24.88)	—	9 (8.26)	—	23 (14.56)	—	$p = .000$
Diverse	57 (8.84)	—	13 (5.99)	—	5 (4.59)	—	11 (6.96)	—	$p = .296$
Family-focused	307 (47.60)	—	114 (52.53)	—	68 (62.39)	—	86 (54.43)	—	$p = .022$
Functional Social Support	.25 (.69)	0-5	.23 (.70)	0-5	.39 (.83)	0-5	.34 (.78)	0-5	$p = .100$
Support Quality									
Positive social support	3.01 (.66)	1-4	2.93 (.67)	2-4	2.75 (.64)	2-4	2.83 (.66)	1-4	$p = .001$
Negative strain	1.51 (.59)	1-4	1.42 (.52)	1-3	1.50 (.62)	1-3	1.50 (.55)	1-3	$p = .246$

Note. Results were reported prior to multiple imputations.

5.1.2 Cox Proportional Hazard Regression Model

Hypothesis #1. Babysitting grandparent caregivers live longer than intermediate/extensive babysitting, custodial, and co-parenting grandparent caregivers.

Hypothesis #2.1. Respondents with diverse and friend-focused networks have lower mortality than respondents with restricted and family-focused networks.

Table 8 presents the mortality hazard ratios for caregiving status, social relations, and other variables. A Cox proportional hazards model was performed to examine the association between caregiving status and mortality risks after controlling for sociodemographic covariates in Model I. Custodial (HR= 1.68, $p<.05$, 95% CI=1.03, 2.76) and co-parenting (HR=1.83, $p<.05$, 95% CI= 1.15, 2.92) grandparents had significantly higher mortality risks over years compared to occasional babysitting grandparents. No difference was observed between intermediate/extensive and occasional babysitting grandparents.

Model II added measures of social network types. The restricted/non-friends group was used as a reference. Respondents in the family-focused group were predicted to have higher mortality risks (HR=1.71, $p<.05$, 95% CI= 1.06, 2.77), in comparison to those in the restricted group. When functional social support, perceived positive support, and negative strain were added in Model III, the hazards ratio for the custodial and co-parenting grandparents were still significantly different than occasional babysitting grandparents (HR= 1.68, $p<.05$, 95% CI=1.02, 2.78; HR= 1.77, $p<.05$, 95% CI=1.00, 2.83), and the family-focused group still predicted higher mortality risks (HR=1.83, $p<.05$, 95% CI= 1.12, 2.98) in comparison with the restricted/non-friends group.

The next model (Model IV) added health and health behaviors. Custodial grandparenting status became non-significant when depressive symptoms, health behaviors, and chronic conditions were added in the model. Among these health measures, exercise had a significant independent effect on mortality risk (HR=1.99, $p < .05$, 95% CI= .98, 1.00). Mortality risk was higher for individuals who were older and male. Education was associated with mortality risk in Model I and II, but its effect did not predict mortality risk once functional support, social support quality, and health measures were added in Models III and IV.

5.1.3 Mediation Analyses

Hypothesis #2.2. Receiving functional support mediates the relationship between caregiving status and mortality.

Hypothesis #2.3. Perceived positive support mediates the relationship between caregiving status and mortality.

Table 9 presents the mediation effects of functional support and support qualities on mortality.

Being a custodial grandparent was significantly related to more functional social support ($b = .09, p < .05$) and less perceived positive support ($b = -.23, p < .01$) than occasional babysitting grandparents. Intermediate/extensive babysitting grandparent status was significantly related to less negative social strain ($b = -.10, p < .05$). In turn, receiving functional social support and negative social strain were positively associated with mortality risk ($b = .11, p < .001$; $b = .03, p < .05$) while perceived positive support was negatively associated with mortality risk ($b = -.03, p < .05$).

Table 9 also shows the results of the indirect/mediation effects that linked caregiving status and mortality. The specific indirect or mediation effects of functional social support on custodial grandparents ($b = .01, p < .05$) and of perceived positive support on custodial grandparents ($b = .01, p < .05$), and the total mediation effects of four mediators ($b = .03, p < .05$) were statistically significant. Without including the multiple mediators, custodial grandparents ($b = .75, p < .01$) and co-parenting grandparents ($b = .51, p < .05$) were significantly related to higher mortality risk compared to occasional babysitting grandparents. After adding the mediators, the relationship became statistically non-significant, suggesting that more functional support and less positive support enhance the negative association between custodial

grandparents and mortality. That is, when custodial grandparents received more functional support or perceived less positive support from networks, they were at elevated risk of mortality.

Table 8. Hazard Ratios of Mortality from 2008 to 2014 (N=1,129)

Variables	Model I		Model II		Model III		Model IV	
	Hazard		Hazard		Hazard		Hazard	
	ratio	95% CI	ratio	95% CI	ratio	95% CI	ratio	95% CI
Caregiving (ref: Occasional babysitting)								
Intermediate/extensive babysitting grandparents	1.06	[.66, 1.74]	1.04	[.65, 1.68]	1.09	[.66, 1.78]	1.12	[.69, 1.83]
Custodial grandparents	1.68*	[1.03, 2.76]	1.69*	[1.04, 2.78]	1.68*	[1.02, 2.78]	1.51	[.90, 2.52]
Co-parenting grandparents	1.83*	[1.15, 2.92]	1.78*	[1.11, 2.85]	1.77*	[1.00, 2.83]	1.69*	[1.04, 2.73]
Network (ref: Restricted/non-friends)								
Friends			1.55	[.85, 2.02]	1.64	[.90, 2.02]	1.61	[.91, 2.03]
Diverse			.94	[.38, 2.35]	.96	[.39, 2.41]	1.34	[.54, 2.43]
Family			1.71*	[1.06, 2.77]	1.83*	[1.12, 2.98]	1.69*	[1.09, 2.89]
Received functional support (log)					2.34***	[1.67, 3.29]	2.15***	[1.52, 3.03]

Perceived Positive Support					.75*	[.57, .99]	.75*	[.57, .98]
Perceived Negative Strain					1.35*	[1.00, 1.81]	1.34†	[.99, 1.82]
Depressive symptoms							1.00	[.99, 1.00]
Smoking							1.01	[1.01,
Self-rated health							1.00	1.02]
								[.99, 1.02]
Drinking alcohol							1.01	[.99, 1.01]
Exercise (Once a week or more)							.99**	[.98, 1.00]
Number of chronic conditions (ref: 0)								
1-2							1.00	[.98, 1.01]
3-4							1.01	[.99, 1.02]
5 or more							1.01†	[1.00, 1.03]
Age	1.01***	[1.06, 1.11]	1.08***	[1.06, 1.11]	1.07***	[1.05, 1.10]	1.00***	[1.00, 1.01]
Female	.46***	[.34, .67]	.47***	[.33, .67]	.46***	[.32, .65]	.47***	[.32, .67]
Income (\$25,000 or more)	.87	[.59, 1.29]	.85	[.57, 1.25]	.90	[.61, 1.34]	1.00	[.99, 1.01]
Education (Some college	.63*	[.41, .96]	.62*	[.40, .96]	.71	[.45, 1.09]	.75	[.48, 1.17]

or more)

Working	.76	[.50, 1.13]	.75	[.50, 1.13]	.77	[.51, 1.16]	1.00	[.99, 1.01]
Chi-square/ <i>df</i>	82.42/ 8		89.18/ 11		123.06/ 14		162.87/ 22	
χ^2 Change			6.55†		34.20***		39.81***	

Notes. †< .10, *< .05, **<.01, ***< .001

Table 9. Mediation Effects of Social Relations on the Effect of Caregiving on Mortality (N=1,129)

	Unstandardized Coefficients	Product of Coefficients		95% CI	
		SE	Z	Lower	Upper
I/E Babysitting grandparents → Functional social support	-.01	.03	-.53	-.08	.04
Custodial grandparents → Functional social support	.09*	.04	2.27	.01	.16
Co-parenting grandparents → Functional social support	.06†	.03	1.76	-.01	.12
I/E Babysitting grandparents → Positive social support	-.08†	.05	-1.65	-.18	.02
Custodial grandparents → Positive social support	-.23**	.07	-3.35	-.36	-.09
Co-parenting grandparents → Positive social support	-.11†	.06	-1.91	-.22	.003
I/E babysitting grandparents → Negative social strain	-.10*	.04	-2.34	-.19	-.02
Custodial grandparents → Negative social strain	.01	.06	.14	-.11	.12
Co-parenting grandparents → Negative social strain	.01	.05	.21	-.10	.11
I/E Babysitting grandparents → Mortality	.01	.02	.03	-.04	.05
Custodial grandparents → Mortality	.03	.03	.98	-.02	.11
Co-parenting grandparents → Mortality	.04	.03	1.57	-.002	.11
Functional social support	.13***	.03	5.17	.08	.18

→ Mortality					
Positive social support	-.03*	.01	-2.34	-.06	-.01
→ Mortality					
Negative social strain	.03*	.02	2.15	.003	.07
→ Mortality					
Indirect/Mediation Effects on Mortality					
Received functional support on I/E babysitting grandparents	-.002	.004	-.53	-.01	.01
Received functional support on Custodial grandparents	.01*	.01	2.08	.00	.02
Received functional support on Co-parenting grandparents	.01†	.00	1.66	-.00	.02
Perceived positive support on I/E babysitting grandparents	.003	.00	1.35	-.00	.01
Perceived positive support on Custodial grandparents	.01*	.004	1.98	-.001	.01
Perceived positive support on Co-parenting grandparents	.003	.002	1.48	-.001	.01
Negative social strain on I/E babysitting grandparents	-.003	.002	-1.58	-.01	.001
Negative social strain on Custodial grandparents	.001	.001	.14	-.002	.002
Negative social strain on Co-parenting grandparents	.002	.001	.21	-.002	.002
Total Mediation Effects	.03*	.01	2.22	.003	.05

Notes. Reference group of caregiving status was occasional babysitting grandparents. I/E= Intermediate/extensive.

†< .10, *< .05, **<.01, ***< .001

6.0 DISCUSSION

This study examined the association between grandparent caregiving and mortality hazards. Psycho-biological health pathways, such as chronic conditions, health behaviors, and depressive symptoms, which may contribute to differences in the study of social relations and mortality (Luo et al, 2012) and may lead to death were controlled in the analyses. As a substantial body of research has documented strong relationships between social relations and health outcomes, this study further extends our understanding of social relations as mediators in the relationship between grandparent caregiving and mortality. Using a population-based national sample of older Americans, this study was guided by a convoy model of social relations, which highlights social network structure and relationship processes over time. In addition, multiple mediation effects of social network, social support, and support quality were examined simultaneously on the relationships between grandparent caregiving and mortality.

The results of this study reveal that co-residential grandparents with grandchildren may experience increased mortality risk compared to occasional babysitting grandparents. Of particular concern, co-parenting grandparent status was still significantly associated with mortality risk after controlling for health pathway variables. Custodial grandparents were shown to receive more functional support but perceived less positive support, which further enhanced the negative association between custodial grandparents and increased mortality risk.

6.1 CAREGIVING STATUS AND MORTALITY

It is well-known that helping behavior is associated with reduced mortality risk. Recent research has examined the relationships between grandparent caregiving and mortality hazards and found that grandparents who provide babysitting for grandchildren showed lower rates of mortality risk than non-caregiving grandparents and non-grandparents (Hillbrand et al., 2017). However, it is not possible to simply conclude that grandparent caregiving is beneficial to survival since grandparent caregivers vary in their custodial status, living arrangements, amount of care provided to grandchild(ren), and the consequences of caregiving, this study was conducted in an effort to support previous research through examining various caregiving statuses in relations to mortality.

Results of the study show that custodial and/or co-parenting grandparents had higher mortality risks in comparison to grandparents who provided occasional babysitting and residing with and taking custodial responsibility of grandchildren may influence grandparent caregivers' health. For non-residential grandparent caregivers, caregiving hours or intensity does not matter for mortality, and there were no statistically significant differences between intermediate/extensive babysitting grandparents and occasional babysitting grandparents.

Findings also indicate that grandparents co-residing with grandchildren predicted all-cause mortality over a 6-year period independent of demographic factors, especially among co-parenting grandparents. By contrast, among custodial grandparents co-residing, and taking legal custody of grandchild(ren), health pathway variables may explain the variance in mortality risk.

As research has consistently pointed out, custodial grandparents present higher rates of depressive symptoms, emotional problems, and social isolation when compared to traditional grandparents, or those who occasionally babysits their grandchildren (Hayslip & Kaminski,

2005). Moreover, custodial grandparents typically take custody of grandchildren when their adult children face imprisonment, drug related issues, or other mental health issues and they often provide custodial care to keep their grandchildren out of foster care (Baker, Silverstein, & Putney, 2008; Hayslip & Kaminski, 2005). Such complex familial situations may push even custodial grandparents who have health and mobility problems to take care of grandchildren. As shown in this analysis, custodial grandparents were also likely to be older in age, unemployed, with less education and less wealth. These findings are consistent with the previous studies documenting that custodial grandparents are more likely to experience disadvantages in health and SES (Minkler & Fuller-Thomson, 2001). Therefore, health pathways and socioeconomic resource may be important to address adverse caregiving effects on mortality.

By contrast, our findings indicated that co-parenting grandparenting may be associated with increased mortality risk even after controlling for health pathway variables, suggesting other variables rather than health may be related to mortality risk, and they may experience distress from relationships from co-residing family members. As Goodman and Silverstein (2006) reported, subtle family relationships, such as grandmother- grandchild closeness and grandmother-parent closeness, could be an important factor which influences caregivers' health. One multifaceted qualitative study also showed that co-parenting grandparents were particularly likely to report stress related to living with their adult children (Musil & Standing, 2005). Although it is a common assumption that custodial grandparents have the largest burden of care, the complex system of parental and grandparental involvement should be addressed in the provision of care. Also, as previous research has found associations between chronic stress and increased mortality (Ohlin, Nilsson, Nilsson, & Berglund, 2004), future research needs to examine various factors related to stress in grandparents co-residing grandchildren.

Baker and colleagues (2008) described custodial grandparents as “part of a continuum of care that ebbs and flows with the needs and problems in the middle generation” (Baker et al., 2008, p. 60), because custodial grandparents may evolve into co-parenting grandparents if their adult children return or become more involved in child care. During these complex familial transitions, many co-parenting grandparents take on a large share of parental responsibility despite parental presence in the household (Mutchler & Baker, 2004). In some cases, co-resident parents may be unable or unwilling to effectively contribute to parental responsibilities; examples of this may include developmental disability, teen pregnancy, drug/alcohol abuse, or incapacitation due to illness (Baker et al., 2008). An example of such an illness is AIDS. Grandparents with a child who had AIDS share substantial responsibility for their grandchildren while the parents are still alive in the advanced stages of the disease (Cowgill et al., 2007).

Custodial grandparents may still share parental responsibility with the parent even in the residential absence of a parent. Data from the U.S. Decennial Census reveal that a number of custodial grandparents do not claim primary responsibility for their co-resident grandchildren (Mutchler & Baker, 2004). According to Baker (2006), nearly two thirds of custodial grandparents reported at least daily contact with the parent of grandchildren. This might show that the presence of a parent in the household is not directly associated with the provision of childcare and the absence may not prevent support from the adult child. Living arrangements with parents within these households are quite often fluid, and grandparents are likely to move in and out of their caregiver role depending on the needs of their adult children and grandchildren (Lee, Ensminger, & LaVeist, 2005). This complex familial fluidity needs more attention in examining such multigenerational families.

Conversely, grandparents who face dwindling savings or diminishing health may co-reside with their adult children to gain assistance with finances or personal care (Ellis & Simmons, 2014). When co-parenting grandparents have poorer health and fewer financial resources, grandparenting may be more stressful. Also, when generations are compressed, the impacts of grandparenting are as diverse as grandparenting contexts themselves. As grandparenting becomes more diverse, and as economic and demographic changes shape our societies and families, greater attention to this diversity is needed.

In contrast to co-parenting grandparents, custodial grandparents were not identified as having mortality risk after accounting for the role of health pathway variables. Research has found that custodial grandparents were also greatly associated with numerous adverse health outcomes, including increased frailty (Chen, Mair, Mao, & Yang, 2014), poorer self-rated health (Chen & Liu, 2011), and greater coronary heart disease risk (Lee, Colditz, Berkman, & Kawachi, 2003). Also, custodial grandparents are less likely to be able to complete menial tasks (e.g., walk six blocks), and engage in preventative health initiatives (e.g., cholesterol screening, pap smears) than their non-custodial counterparts (Baker & Silverstein, 2008). This fact is highly attributed to the fact that custodial grandparents often do not have time to care for themselves as a result of caregiving demands. They may neglect their own health because they feel selfish taking time for themselves as they may feel compelled to focus their energy on the grandchild's needs (Baker & Silverstein, 2008); this can lead to increased perceived barriers from preventative health behavior.

Grandparents living with grandchild need support from various resources. When demands are heavy and resources scarce, grandchildren care leads to grandparents' health decline. According to Minkler (2001), elevated functional limitations among custodial

grandparents may be explained by the fact that such grandparents may be more frequently exposed to their functional limitations as a consequence of their childcare roles. When grandparents care for young grandchildren, they may more frequently report functional limitations. Because greater functional limitations are significantly correlated with poor self-rated health and short-term mortality (Idler & Kasl, 1991), further research should evaluate the factors which lead to poor health outcomes among grandparent caregivers.

6.2 INFLUENCE OF SOCIAL NETWORK TYPE ON MORTALITY

Results from the latent class analysis identified four clusters of social network type: diverse, friend-focused, family-focused, and restricted/ non-friends. Classification of network type allows comprehensive consideration of the interpersonal environments of older adults in relation to health outcomes. Understanding the social network situation of grandparent caregivers would allow social service programs to be directed at the targeted groups of older adults. For example, Litwin (1998) showed that older adults in family-focused and traditional extended family networks were in a relatively poor state of health and had more limited access to formal health services, while more diverse, friend-focused networks were linked with better health status. By distinguishing between different kinds of interpersonal social environments among older grandparent caregivers, this study improves our knowledge of social network types in that the role of friends and neighbors may be pronounced for older grandparents

The results indicate that those with a family-focused social network had the highest probability of mortality risk compared to those with a restricted network. Even after adjusting health pathways, the associations remained statistically significant for the family-focused

network group, probably because respondents in this group have limited access to formal or informal help or support outside of the household and increased dependency upon family. It could also be possible that the quality of their relationships with family members may be worse than those of grandparents in other types of network. Particularly, custodial grandparents showed high dependency on a family-focused network. Stress in relationships contributes to negative health habits and outcomes. Future research needs to consider including dyadic information about relationships among family members.

The non-friends network group needs closer examination. Those in this group were generally unmarried and had a lack of contact with friends and organizational settings. Individuals with fewer social connections and less organizational participation may be less able than others to buffer the physiological and health impacts of social life challenges (Smith & Christakis, 2007; Yang, McClintock, Kozloski, & Li, 2013). Therefore, a friendship network could be a significant factor in reducing all-cause mortality rates among older adults (Aida et al., 2012). Public investment to promote developing positive social networks is suggested to reduce negative health outcomes and mortality risk among older adults. It is well-known that socially isolated individuals are deprived of opportunities for emotional and instrumental support, which can decrease sense of control and self-esteem (Thoits, 2010). A deficiency in social connections and coping mechanisms may bring about maladaptive personal control, which means that individuals are not able to influence their own behaviors through health enhancing knowledge and preventative behaviors (Umberson, Crosnoe, & Reczek, 2010).

As documented in the literature, grandparents who participated in special programs (i.e., stress and coping mechanisms) fared better than those who did not access such resources (Lumpkin, 2008). A support network provides palliative effects on the emotional well-being of

grandparent caregivers by buffering the deleterious effects of caregiving stress (Gerard et al., 2006). With no person to help shoulder the caregiving burden, caregivers' stress may increase. Kawachi and Berkman (2000) introduced several plausible pathways linking social capital to health. First, they state that social networks may affect individual health by influencing health-related behaviors through promotion of more rapid diffusion of health information and by exerting social control over deviant health-related behaviors (Aida et al., 2011; Kawachi & Berkman, 2000). Secondly, they have shown that a greater social network may promote good access to services such as transportation, clinics, and community health centers. Third, they state that social networks can buffer the negative effects of life events on mental health (Kawachi & Berkman, 2001). Finally, they point out that communities with greater social networks can produce more egalitarian patterns of political participation and implement policies which ensure the security of all its members (Kawachi & Berkman, 2000).

Although this study did not examine cultural differences in grandparent caregivers, some evidence showed that grandparents from cultures with a strong extended-family tradition adapt more successfully to their custodial role than grandparents from cultures without this tradition (Letiecq, Bailey, & Kurtz, 2008; Ross & Aday, 2006). For example, African-American grandmothers who were sole providers for their grandchildren and Hispanic grandmothers who were co-parenting grandmothers were less distressed than White grandmothers (Goodman & Silverstein, 2006). Custodial grandparenting from less developed regions is more common and older immigrants from rapidly developing countries in Asia often provide full-time care for grandchildren.

Also, as many developing countries have experienced rapid social and economic changes, the traditional support system has changed, and filial norms are becoming more elastic.

Particularly, intergenerational co-residence is based more on meeting the needs of adult children than on the needs of older adults (VanWey & Cebulko, 2007). It is necessary to approach grandparent caregivers within a culture or social psychological framework in systematic and dynamic ways.

6.3 FUNCTIONAL SOCIAL SUPPORT AND POSITIVE PERCEIVED SUPPORT AS MEDIATORS

Functional social support was directly and indirectly associated with the association between the custodial/co-parenting grandparents and mortality. Physical activity is important in maintaining higher levels of functioning (Lee & Park, 2006), and previous studies have reported that grandparent caregivers experience restrictions in their daily routine functioning (Whitley, Fuller-Thomson, & Brennenstuhl, 2015). These results indicate that receiving support as a result of functional limitations may be associated with mortality, particularly for custodial grandparents receiving functional support, who were strongly associated with mortality.

As Whitley et al. (2015) reported, nearly 33% of solo grandparents raising grandchildren experienced functional limitations due to physical or mental health conditions; therefore, there is a subpopulation of custodial grandparents who are susceptible to severe health risks and require health care support. Although it is not clear if this finding reflects the effects of burdened caregiving responsibilities, normative aging effects, or a combination of these or other factors, great efforts are needed to find out how functional limitations affect personal and family caregiving responsibilities among custodial grandparents because family caregiving responsibilities rest largely with them (Whitley et al., 2015). For example, grandparents living

with young grandchildren may carry out some of the physical tasks associated with parenting. Being unable to carry them out adequately means that the health and well-being of their grandchildren is also seriously impacted.

Custodial grandparents need to spend more time addressing their own health concerns. They are likely to be in family-focused and socially restricted social networks; therefore, they may have a limited number of network members available to share parenting responsibilities. As older grandparents receive more instrumental support from others due to limited physical functioning, they may feel that available help is less supportive when they live with their grandchildren. Additional research is necessary to clarify if health concerns are severe within certain demographic groups, such as those of a certain age, race, gender, residential locality, or SES among custodial grandparents (Whitley et al., 2015).

In addition, this study found that positive social support mediated the relationships between custodial grandparents and mortality. Positive social support in this study refers to an individual's cognitive appraisal of support to provide coping in individual and familial relationships. Before the mediators were added in the final models, custodial grandparent status was positively associated with mortality. Because many custodial grandparents take on full-time responsibility for their grandchildren, which may cause social isolation from their peers, they may be at risk for inadequate social support (Emick & Hayslip, 1999).

Inadequate social support poses significant problems for custodial grandparents. Positive relationships with family members (adult children and grandchildren) may be particularly important for maintaining health and well-being. Previous studies on social support and relationships and their effect on health focused on enhancing social support and self-care practice, which may act to promote the health of grandparent caregivers (Hayslip, Blumenthal, &

Garner, 2014). Custodial grandparents are confronted with full responsibility for grandchildren, in which a disproportionate number of population suffers from health and behavioral problems related to parental loss, abuse, or neglect (Goodman & Silverstein, 2006). If grandchildren have a greater likelihood of having experienced severe trauma and abuse, which lead to emotional and behavioral problems, their care is likely to negatively affect the health of grandparent caregivers (Goodman & Silverstein, 2006; Hayslip et al, 1998).

Findings suggest that perceived quality of relationships may help custodial grandparents in several ways, including increased feelings of meaningfulness and feelings of belonging (Park, 2009). According to Lin and Ensel's (1984) support deterioration model, stressful events might elicit a shunning or avoidance response by members of the social network. Stigmatizing events might lead network members to avoid contact with individuals experiencing these events or to respond in ways that are unhelpful. Various forms of social stigma that custodial grandparents may experience are likely to leave an indelible mark on their attitudes and beliefs about certain social institutions (Whitley, Kelley, & Campos, 2011). As a result, they might become more unwilling to seek for family support or services.

7.0 LIMITATIONS AND IMPLICATIONS

7.1 LIMITATIONS

One limitation of the current study is the small number in each caregiving status group. Custodial/co-parent grandparent caregivers occupied a very small percentage in the current study; however, this category needs to be separate from the babysitting category due to the nature of caregiving. Because it was such a small group, the custodial/co-parenting grandparent group may have had fewer respondents for the social network and support variables and other covariates (e.g., functional social support, depression). Also, data on the extent of co-residential grandparents' involvement in childcare are not available; therefore, it is often assumed that co-residential grandparents provide extensive care for grandchildren. Although the literature has shown that co-parenting grandparents also have the primary responsibility for the grandchildren, suggesting that both circumstances exert considerable stress on grandparents (Szinovacz, DeViney, & Atknison, 1999), some studies have reported that custodial grandparents are at higher risk of social isolation and elevated emotional distress compared with co-parenting grandparents (Pruchno & McKenney, 2000). Comparisons between custodial and co-parenting grandparents would provide useful information for caregiving families with more information about the extent of caregiving.

Moreover, participants who had missing data may have biased the results. Although multiple imputations were used to minimize this potential issue, this technique assumes that the data are missing at random. Since many respondents did not answer the questions related to social relations there is a possibility that missing data were not randomly missing. However,

multiple imputations are expected to provide more accurate estimates of associations than a simpler method (Little & Rubin, 2002).

Another limitation to mention is that this study shows the confounding effects of caregiving hours among grandparents living with grandchildren. Because the HRS does not provide specific caregiving hours for grandparents living with grandchildren, this study was not able to distinguish the effect of grandparent caregiving, but assumed primary responsibilities of custodial grandparents. Future research needs to investigate the associations and pathways between caregiving time and health outcomes among grandparents living with grandchildren.

Although the association of social relations with all-cause mortality may suggest a general susceptibility to disease, this study is not able to examine the different physiological mechanisms underlying cause-specific associations. For example, for highly educated men, the SNI did not appear to be significantly associated with cancer mortality (Eng et al., 2002). It is necessary to find out whether such differences persist in the general population across causes of death.

In the methodology, this study used multiple mediation analyses on mortality. Recently, researchers have sought to extend the classical Baron-Kenny approach to survival outcomes by applying them directly to the Cox model to overcome the limitations of existing approaches to mediation analysis (Jung et al., 2012). However, according to Lange and Mansen (2011), the important assumption of proportional hazards can never be satisfied for both models with and without the mediator due to the fact that the class of proportional hazard models is not closed under marginalization. An alternative strategy is to integrate survival outcomes within Structural Equation Models (SEM). Pratschke et al (2016) also support the efficacy of SEM in identifying complex casual pathways that mediate the effects of a socio-economic baseline covariate on the

hazard of death. Complex casual pathways using SEM could shed light on research questions in health research studies.

Further, as it is well-known that helping others contributes to good health, grandparenting can promote health and/or retard illness progression by operating some of the physiological and neuroendocrine pathways. However, mixed findings exist, with studies using different measures. More longitudinal research using more rigorous research designs needs to be conducted to examine the impact of social relations on mortality and to determine whether the relationships between these variables are universal or vary by contextual factors such as culture and ethnicity.

Social relations may have changed over time, but only baseline data are available in the analyses. Social relations are changing and transition into caregiving is ongoing; hence, it is important to generate insight about inter-and intra-individual variability and changes across different time points within the transition into caregiving roles (Rohr & Lang, 2014). Also, this study does not include racial differences because race is not a factor of mortality risk. However, the number of Asian and Hispanic older grandparents is expected to increase. As intergenerational family experiences are influenced by diverse culture and racial stratification, racial diversity should be considered. Since they have different experiences in immigration and acculturation, research should measure these differences, and examine justifications for caring for grandchildren in different cultural and ethnic backgrounds.

7.2 IMPLICATIONS

As many types of scientific research show evidence that individuals with the lowest level of involvement in social relationships are more likely to die than those with greater involvement,

how social relations benefit health is an ongoing area of study. Guided by the convoy model, the investigation of multiple dimensions of social relations on health can be especially helpful. Since little is known about the social relations among grandparent caregivers, the examination of their social relations can make a unique contribution to gerontology. The results of this study show that a family-focused network type among grandparent caregivers was associated with mortality. Also, even after adjusting for physiological, behavioral, and psychological pathways to mortality, social isolation from friends or neighbors was still associated with mortality.

7.2.1 Social Network Interventions

Possible implications for interventions among this group include encouraging diversifying of network member composition by incorporating friends and facilitating contact with neighbors and community. Particularly, health and social care practitioners and community organizations can help grandparent caregivers by promoting social activity group interventions or broad community level programs designed specifically to facilitate social interaction (Santini et al., 2015)

Heaney and Israel (2008) suggest that educational and social activity group interventions are effective in promoting social networks, but the effectiveness of home visiting and befriending schemes remained unclear. The authors suggest various forms of social network interventions, which are typically designed to 1) enhance existing network linkages (Wing & Jeffery, 1999), 2) develop new network linkages (Helgeson & Gottlieb, 2000), 3) enhance networks through the use of local helpers and community health workers (Krieger, Takaro, Song, & Weaver, 2005), and 4) enhance networks through community capacity building and problem solving (Minkler, 2001).

For older adults, interventions designed to develop new social network linkages could be useful when the existing network is small, overburdened, or unable to provide effective support. Most often new ties are introduced in response to a major life transition or specific stressor. Heaney and Israel (2008) introduced self-help or mutual aid groups to provide a new set of network ties because members are facing a common stressor or they want to bring about similar changes, either at the individual level or at a community level. Such groups can be particularly effective for participants who cannot mobilize social support from their social relationships. Recently, internet-based support groups have gained in popularity. Although it is unclear whether frequency of interaction and engagement in web-based support groups among older adults, if they can access it, they might easily gain information and support for specific life transitions and health problems (Tennant et al., 2015).

Diverse exchanges of informal (a friend or family member) and formal (contractual or paid arrangement) support are a component of intergenerational relations (Antonucci et al., 2011). Grandparents may turn to a professional care provider and services to complement the support provided by their informal networks or when their informal networks are either unavailable or unable to assist them (Dolbin-MacNab et al., 2013). It also includes governmental assistance and support programs, such as Temporary Assistance to Needy Families (TANF), the Supplemental Nutrition Assistance Program (SNAP), the foster care system, the Women Infants and Children (WIC) program, aging services, and community support groups (Dolbin-MacNab et al., 2013). Grandparent caregivers receive inadequate support from both their informal and formal network because they are assuming that their caregiver role is off-time.

7.2.2 Social Support Intervention- Strengths-based Community Services

Since the late 1980s, a strengths-based model of working with individuals and families has emerged and been developed to resolve problems and issues. In line with the strength-based model, an empowerment approach has been increasingly applied in practice with grandparent caregivers, especially with women and people of minority groups (Whitley et al., 2013). Although there are many definitions, there is consensus that empowerment involves gaining control over one's life and being motivated to work towards positive change (Whitley et al., 2013). The immediate goal of empowerment is to help individuals achieve a sense of power, become aware of the linkages between individual and community problems, and work collaboratively toward social change (Gutierrez, GlenMaye, & DeLois, 1995). The small group modality is the foundation of empowerment practice; promoting dialogue, critical thinking, and action in the small group are often used (Cox, 2003).

Grandparent caregivers, especially custodial grandparents, are provided with an array of support services, including home-based visitation services, case management, respite care, health services, support groups, parenting classes, legal assistance, and material aid (Kelley et al, 2001; Whitley et al., 2013). These services are often packaged in the form of community-based interventions. A community-based health intervention provides a good example. Drawing on the resilience model of family stress, adjustment, and adaptation (Cohon, Hines, Cooper, Packman, & Siggins, 2003), Kelley and colleagues (2013) examined the efficacy of a community-based intervention to improve the health of caregiving grandparents. After the intervention, the grandparents had increased knowledge about health behaviors, improved access to health resources, and improved self-care health practice (Kelley et al., 2013). This study indicates that community-based interventions tailored to grandparents' needs may be effective in ameliorating

the stresses resulting from parenting demands and affecting grandparents' adaptation to the demands of raising grandchildren.

Most of all, for social workers and human service professionals, understanding the role of custodial and co-parenting grandparents is important to strengthening diverse families and communities. Social workers need to help grandparents become more knowledgeable about available services and enhance the likelihood of service utilization. It is important to understand policies pertinent to this population and assist grandparents in overcoming barriers to service use. Getting custody of their grandchildren when necessary and obtaining supportive services such as respite care and individual counseling may be provided by a state program, a local area agency on aging, or a contract service provider under the National Family Caregiver Support Program (Hayslip & Kaminski, 2005; Tang, Jang, & Copeland, 2015). Also, social workers can educate service providers about how to interact with grandparents, advocate for service programs improving access to service and making system level change, and address the fragmentation of services and providers for children, family, and older adults.

Policy makers and social service providers must identify vulnerable custodial and co-parenting grandparent families and give attention to caregiver families' strengths and weaknesses. Some ethnic minorities may have culture-specific perceptions of the grandparent role that prevent them from seeking formal social services (Yancura, 2013). The traditional family and child welfare system may not be sufficient to meet the needs of grandparent-headed families because their family patterns are unique and often are composed of caregivers who themselves are in need of health and financial supports (Bertera & Crewe, 2013). The Affordable Health Care Act is a policy which has supported the financial burden of grandparents and other relative caregivers in meeting their medical needs. If preventive services are included as part of

Medicare, fragile grandparents can have needed services that protect their quality of life. Grandparents may also benefit from working with a Kinship Care System Navigator (KCSN). A KCSN is a designated person who works with grandparents and other kin caregivers responsible for parenting children (Fruhauf, Pevney, & Bundy-Fazioli, 2015). The navigator links connect grandparent caregivers to services they may need (Cox, 2009) and provide social support when needed as they listen to grandparents' concerns.

7.2.3 Social Support Intervention- Individual Family-oriented Interventions

Grandparents experience important gains through programs that include parent education, live-in nurseries, or enhanced mother-child relationships (Engstrom, 2008). Gains may include improvements in grandparents' perceptions of their relationships with their children (Snyder, Carlo, & Mullins, 2002), enhanced parenting knowledge and skill (Campbell & Miles, 2008), and enhanced self-esteem (Cox, 2003). Family-oriented interventions aim to change parenting styles and practices, which can increase a sense of social support (Engstrom, 2008). One example is psychosocial skills-based intervention (Hayslip, 2003). The 6-week intervention focuses on key parenting skills (e.g., communication skills, goals of discipline, modeling desirable behavior, developing cooperation); dealing with grief, depression, and anger in grandchildren; communicating about drug and drug abuse; and managing attention-related difficulties (Hayslip & Kaminski, 2005). Such intervention provides both content delivery as well as open discussion with group leaders about ways participants can handle these key issues. Moreover, skills training interventions that expand other skills-based programs and assist grandparents with effective communication, mood and stress management techniques, as well as

effective parenting techniques might help in caretaker grandparents build resilience and reduce negative outcomes for the grandparent and grandchild.

7.2.4 Approaches in the Studies of Grandparent Caregiving

According to Jones et al. (2011), theoretical frameworks are crucial in promoting an understanding of the origins of behavior, as they guide professionals in their actions taken to prevent, reduce, or eliminate a problem. Caregivers' additional role is likely to have an impact upon their social relationships and convoys of support. Research has shown that professionals can approach possible solutions, such as social support, therapy, social services, and public policies, by looking at factors located both inside and outside one's social network. Since social problems may create individual or family problems, they should be addressed by both individual and family levels and social contexts that impact grandparent families.

As a theoretical and methodological approach, the convoy model of social relations has multidimensional roots (Antonucci et al., 2014). The convoy model has been used by researchers in multiple disciplines including anthropology, epidemiology, human development, psychology, sociology, and social work. Understanding social relations using multidisciplinary approaches will encourage the development of programs and interventions that allow greater exposure to various perspectives of the social relations among grandparent caregivers.

Moreover, grandparent caregiving research needs prospective, longitudinal studies grounded in innovative frameworks that investigate resilience and protective factors from role changes and transitions. Such research should consider individual difference variables,

sociodemographic characteristics and psychological and social resources to other aspects of the sociocultural context, including interpersonal issues; cultural variables; the availability, accessibility and acceptability of services; system and organizational factors; and local and national policy (Hayslip & Smith, 2013).

With rapid social changes, the traditional nuclear family now represents less than 25 percent of the population, but there is little information about the new (non-traditional) family types, such as non-grandparents. For non-grandparents, friendship may be more influential than family relations on an individual's well-being. Thus, in a context of some community support the absence of family is less detrimental than the absence of friends. More attention needs to be given to examining traditional and emerging needs of family, friends, and neighbors along with the old and new personal and situational characteristics of grandparent caregivers.

The effect of ethnic and racial context on the grandparenting role should be considered as it impacts adaptation to custodial or co-parenting family structures (Goodman & Silverstein, 2006). In the United States, ethnicity is primarily associated with race, religion, or natural origin as people identify these as factors putting them into a specific ethnic group (Bhopal, 2004). Compared to other influences on grandparenting, race/ethnicity has been unexplored despite its impact on the success of grandparent caregivers (Hayslip et al., 2009). In particular, in order to examine the relationships with grandchildren, researchers should consider the diversity and context where grandparent-grandchild relationships are embedded and lifelong patterns through family experiences, exchange, and attachment in order to understand contemporary intergenerational relationships (Stelle et al., 2010).

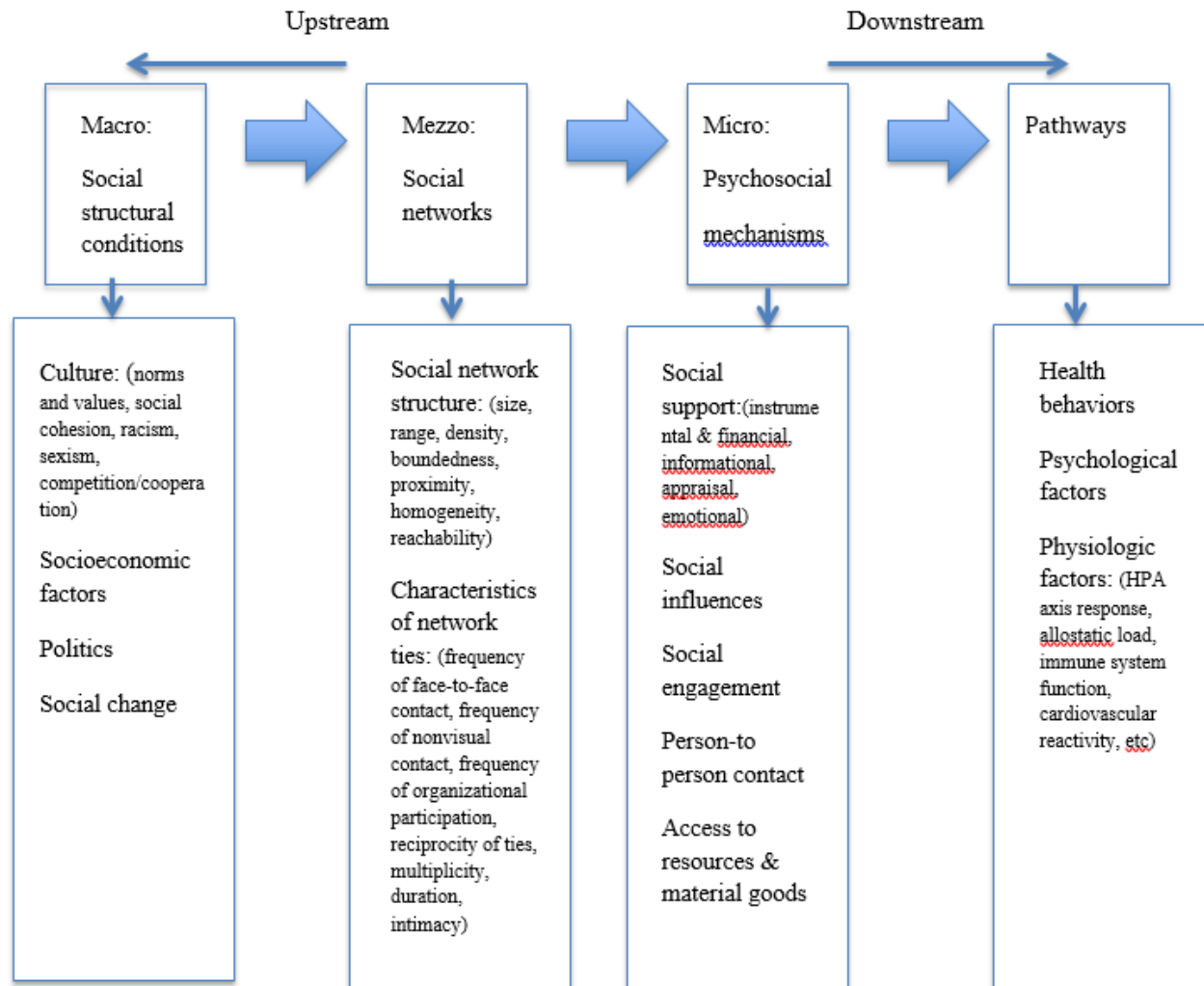
8.0 CONCLUSION

Research has identified individual and interpersonal mechanisms linking grandparenting to physical and mental health. As shown in a growing number of studies examining the effects of parenthood on mortality, it is possible that the survival advantages of parents over non-parents is due to confounding effects from biological or social factors that influence the chances of having children and the risk of death. Among grandparent caregivers, this study found that custodial and co-parenting grandparents who live with their grandchildren were significantly associated with increased rates of mortality. Although altruistic behavior in general has been shown to help increase one's well-being, extensive caregiving responsibility could be detrimental to older grandparent caregivers.

This study points out that relationships with friends and neighbors may be more influential on well-being in later life. It is important for grandparent caregivers to receive reliable support from family members and friends necessary to fulfill their familial obligations. Having frequent contact with friends and relatives may decrease the sense of isolation in the role. Due to the complexity in social relations, more research is necessary to quantify and qualify the relationships with friends, neighbors, and formal support programs.

Also, close relationships help grandparents in shaping their sense of well-being by allowing them to cope better in critical circumstances. Particularly, this study suggests that positive social relations may help caregivers achieve or maintain their well-being; thus, levels of intervention and support programs are both essential to help older caregivers adjust to the new parent role. Practitioners should help grandparents become more knowledgeable about available service and so enhance the likelihood of their utilizing the services.

Appendix A Conceptual Model of the Influence of Social Networks on Health



Bibliography

- Adams, R. G., & Blieszner, R. (1995). Aging well with friends and family. *American Behavioral Scientist*, 39(2), 209-224.
- Adelmann, P.K. (1994). Multiple roles and psychological well-being in a national sample of older adults. *Journal of Gerontology: Social Sciences*, 49(6), S277-S285. Doi: 10.1093/geronj/49.6.S277
- Ahmad, R., & Bath, P. A. (2005). Identification of risk factors for 15-year mortality among community-dwelling older people using Cox regression and a genetic algorithm. *The Journals of Gerontology Series A: Biological Sciences and Medical Sciences*, 60(8), 1052-1058.
- Aida, J., Kondo, K., Hirai, H., Subramanian, S. V., Murata, C., Kondo, N., ... & Osaka, K. (2011). Assessing the association between all-cause mortality and multiple aspects of individual social capital among the older Japanese. *BMC Public Health*, 11(1), 499.
- Aida, J., Kondo, K., Kawachi, I., Subramanian, S. V., Ichida, Y., Hirai, H., ... & Watt, R. G. (2012). Does social capital affect the incidence of functional disability in older Japanese? A prospective population-based cohort study. *J Epidemiol Community Health*, jech-2011.
- Alwin, D.F., & McCammon, R.J. (2003). Generations, cohorts, and social change. In J.T. Mortimer and M.J. Shanahan (Eds.), *Handbook of the Life Course* (pp. 23-49). New

York: Kluwer Academic / Plenum Publishers.

Antonucci, T.C. (1985). Personal characteristics, social support, and social behavior. In R.H. Binstock & E. Shanas (Eds.), *Handbook of aging and the social sciences* (2nd ed.). Princeton, NJ: Van Nostrand-Reinhold.

Antonucci, T. C. (2001). Social relations an examination of social networks, social support. *Handbook of the psychology of aging*, 3, 427-453.

Antonucci, T. C., Ajrouch, K. J., & Birditt, K. S. (2014). The convoy model: Explaining social relations from a multidisciplinary perspective. *The Gerontologist*, 54(1), 82-92.

Antonucci, T. C., & Akiyama, H. (1995). Convoys of social relations: Family and friendships within a life span context. In R. Blieszner and V. H. Bedford (Eds), *Handbook of Aging and the Family* (pp. 355-371). Westport, CT: Greenwood.

Antonucci, T. C., Birditt, K. S., Sherman, C. W., & Trinh, S. (2011). Stability and change in the intergenerational family: A convoy approach. *Ageing and Society*, 31(07), 1084-1106.

doi: <http://dx.doi.org/10.1017/S0144686X1000098X>

Antonucci, T. C., Birditt, K. S., & Webster, N. J. (2010). Social relations and mortality: A more nuanced approach. *Journal of Health Psychology*, 15(5), 649-659.

doi: 10.1177/1359105310368189

Antonucci, T. C., Fiori, K. L., Birditt, K., & Jackey, L. M. (2010). Convoys of Social Relations: Integrating Life-Span and Life-Course Perspectives. *The handbook of life-span development*.

- Antonucci, T. C., Fuhrer, R., & Dartigues, J. F. (1997). Social relations and depressive symptomatology in a sample of community-dwelling French older adults. *Psychology and aging*, 12(1), 189.
- Antonucci, T.C., Langfahl, E.S., & Akiyama, H. (2004). Relationships as outcomes and contexts. In F.R. Lang., & Fingerman, K.L. (Eds), *Growing together: Personal relationships across the lifespan*. *Advances in personal relationships* (pp. 24-44). New York, NY: Cambridge University Press
- Antonucci, T.C., & Wong, K.M. (2010). Public health and the aging family. *Public Health Reviews*, 32 (2), 512-531.
- Arpino, B., & Bordone, V. (2014). Does grandparenting pay off? the effect of child care on grandparents' cognitive functioning. *Journal of Marriage and Family*, 76(2), 337-351.
- Baker, L. A., & Silverstein, M. (2008). Preventive health behaviors among grandmothers raising grandchildren. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 63(5), S304-S311.
- Baker, L. A., Silverstein, M., & Putney, N. M. (2008). Grandparents raising grandchildren in the United States: Changing family forms, stagnant social policies. *Journal of societal & social policy*, 7, 53-69.
- Bath, P. A. (2003). Differences between older men and women in the self-rated health–mortality relationship. *The Gerontologist*, 43(3), 387-395.

- Bengtson, V. L., & Allen, K. R. (2009). The life course perspective applied to families over time. In *Sourcebook of family theories and methods* (pp. 469-504). Boston, MA: Springer.
- Ben-Ezra, M., & Shmotkin, D. (2006). Predictors of Mortality in the Old-Old in Israel: The Cross-Sectional and Longitudinal Aging Study. *Journal of the American Geriatrics Society*, 54(6), 906-911.
- Berkman, L. F. (1995). The role of social relations in health promotion. *Psychosomatic Medicine*, 57(3), 245-254.
- Berkman, L. F., Glass, T., Brissette, I., & Seeman, T. E. (2000). From social integration to health: Durkheim in the new millennium. *Social science & medicine*, 51(6), 843-857.
- Berkman, L. F., & Syme, S. L. (1979). Social networks, host resistance, and mortality: a nine-year follow-up study of Alameda County residents. *American journal of Epidemiology*, 109(2), 186-204.
- Bertera, E. M., & Crewe, S. E. (2013). Parenthood in the twenty-first century: African American grandparents as surrogate parents. *Journal of Human Behavior in the Social Environment*, 23(2), 178-192. doi: 10.1080/10911359.2013.747348
- Bhopal, R. (2004). Glossary of terms relating to ethnicity and race: for reflection and debate. *Journal of Epidemiology & Community Health*, 58(6), 441-445.
- Biddle, B. J. (1979). *Role theory: Concepts and research*. New York: John Wiley & Sons, Inc.
- Biddle, B.J. (1986). Recent development in role theory. *Annual Review of Sociology*, 12, 67-92.

- Birditt, K., & Antonucci, T. C. (2008). Life sustaining irritations? Relationship quality and mortality in the context of chronic illness. *Social Science & Medicine*, 67(8), 1291-1299.
- Birditt, K. S., Fingerman, K. L., & Zarit, S. H. (2010). Adult children's problems and successes: Implications for intergenerational ambivalence. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 65(2), 145-153. doi: 10.1093/geronb/gbp125
- Black, B.P., Holditch-Davis, D., & Miles, M.S. (2009). Life course theory as framework to examine becoming a mother of a medically fragile preterm infant. *Research of Nursing Health*, 32(1), 38-49.
- Blazer, D. G. (1982). Social support and mortality in an elderly community population. *American journal of epidemiology*, 115(5), 684-694.
- Brown, S. L., Brown, R. M., House, J., & Smith, D. (2008). Coping with spousal loss: The potential buffering effects of self-reported helping behavior. *Personality & Social Psychology Bulletin*, 34, 849–861. doi: 10.1177/0146167208314972
- Brown, S. L., Nesse, R. M., Vinokur, A., & Smith, D. (2003). Providing social support may be more beneficial than receiving it: Results from a prospective study of mortality. *Psychological Science*, 14, 320–327. doi:10.1111/1467-9280.14461
- Burnette, D. (1999). Social relationships of Latino grandparent caregivers: A role theory perspective. *The gerontologist*, 39(1), 49-58.
- Burns, E. R., Stevens, J. A., & Lee, R. (2016). The direct costs of fatal and non-fatal falls among older adults—United States. *Journal of safety research*, 58, 99-103.

- Burton, L. M. (1996). Age norms, the timing of family role transitions, and intergenerational caregiving among aging African American women. *The Gerontologist*, 36(2), 199-208.
- Campbell, L., & Miles, M. S. (2008). Implementing parenting programs for custodial grandparents. *Parenting the custodial grandchild: Implications for clinical practice*, (pp. 115-130). New York: Springer.
- Chen, F., & Liu, G. (2011). The health implications of grandparents caring for grandchildren in China. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 67(1), 99-112.
- Chen, F., Mair, C. A., Mao, L., & Yang, Y. C. (2014). Race/ethnic differentials in the health consequences of caring for grandchildren for grandparents. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 70(5), 793-803.
- Christiansen, S. G. (2014). The association between grandparenthood and mortality. *Social science & medicine*, 118, 89-96.
- Clausen, J. A. (1995). *American lives: Looking back at the children of the Great Depression*. University of California Press.
- Conway, F., Jones, S., & Speakes-Lewis, A. (2011). Emotional strain in caregiving among African American grandmothers raising their grandchildren. *Journal of Women and Aging*, 23, 113-128. doi: 10.1080/08952841.2100.561142
- Cooper, H. (2002). Investigating socio-economic explanations for gender and ethnic inequalities in health. *Social science & medicine*, 54(5), 693-706.

- Cowgill, B. O., Beckett, M. K., Corona, R., Elliott, M. N., Zhou, A. J., & Schuster, M. A. (2007). Children of HIV-infected parents: custody status in a nationally representative sample. *Pediatrics*, 120(3), e494-e503.
- Cox, C. (2009). Custodial grandparents: Policies affecting care. *Journal of Intergenerational Relationships*, 7(2-3), 177-190.
- Cox, C. B. (2003). Designing interventions for grandparent caregivers: The need for an ecological perspective for practice. *Families in Society*, 84(1), 127-134.
- Cox, D. R. (1972). Regression models and life-tables. *Journal of the Royal Statistical Society: Series B (Methodological)*, 34(2), 187-202.
- Cox, D. R. (1992). Regression models and life-tables. In *Breakthroughs in statistics* (pp. 527-541). Springer New York.
- Cox, M. J., & Paley, B. (1997). Families as systems. *Annual Review of Psychology*, 48(1), 243-267.
- Cuijpers, P., & Smit, F. (2002). Excess mortality in depression: a meta-analysis of community studies. *Journal of affective disorders*, 72(3), 227-236.
- Drew, L. M., & Silverstein, M. (2007). Grandparents' psychological well-being after loss of contact with their grandchildren. *Journal of family psychology*, 21(3), 372-379. doi: 10.1037/0893-3200.21.3.372
- Ellis, R., & Simmon, T. (2014). Co-resident grandparents and their grandchildren: 2012. Current Population reports, US Census Bureau, Washington, DC. USA

- Elder, G. H. (1994). Time, human agency, and social change: Perspectives on the life course. *Social psychology quarterly*, 4-15.
- Elder, G. H. (1998). The life course as developmental theory. *Child Development*, 69(1), 1-12.
- Emick, M. A., & Hayslip Jr, B. (1999). Custodial grandparenting: Stresses, coping skills, and relationships with grandchildren. *The International Journal of Aging and Human Development*, 48(1), 35-61.
- Eng, P. M., Rimm, E. B., Fitzmaurice, G., & Kawachi, I. (2002). Social ties and change in social ties in relation to subsequent total and cause-specific mortality and coronary heart disease incidence in men. *American journal of epidemiology*, 155(8), 700-709.
- Engstrom, M. (2008). Involving caregiving grandmothers in family interventions when mothers with substance use problems are incarcerated. *Family process*, 47(3), 357-371.
- Fiori, K. L., Antonucci, T. C., & Cortina, K. S. (2006). Social network typologies and mental health among older adults. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 61(1), P25-P32.
- Fisher, G. G., Faul, J. D., Weir, D. R., Wallace, R. B., Herzog, A. R., Ofstedal, M. B., & Langa, K. M. (2005). HRS/AHEAD Documentation Report. Documentation of Chronic Disease Measures in the Health and Retirement Study. Retrieved from <https://hrs.isr.umich.edu/sites/default/files/biblio/dr-009.pdf>
- Friedman, H. S., Tucker, J. S., Schwartz, J. E., Tomlinson-Keasey, C., Martin, L. R., Wingard, D. L. et al. (1995). Psychosocial and behavioral predictors of longevity: The aging and

- death of the 'Termites'. *American Psychologist*, 50, 69–78. doi: 10.1037/0003-066X.50.2.69.
- Fuller-Thomson, E., Minkler, M., & Driver, D. (1997). A profile of grandparents raising grandchildren in the United States. *The Gerontologist*, 37(3), 406-411.
- Fuller-Thomson, E., & Minkler, M. (2000). America's grandparent caregivers: Who are they? In B. Hayslip, & R. Goldberg-Glen (Eds.), *Grandparents raising grandchildren: Theoretical, empirical, and clinical perspectives* (pp. 3-21). New York: Springer.
- Fuller-Thomson, E., & Minkler, M. (2001). American grandparents providing extensive child care to their grandchildren: Prevalence and profile. *The Gerontologist*, 41(2), 201-209.
- Fuller-Thomson, E., & Minkler, M. (2003). Housing issues and realities facing grandparent caregivers who are renters. *The Gerontologist*, 43(1), 92-98. doi: 10.1093/geront/43.1.92
- Generation United (2007). Fact sheet. Retrieved from <http://www.gu.org/LinkClick.aspx?fileticket=Lgq5WfhP-Tg%3D&tabid=157&mid=606>
- Landry-Meyer, L. (1999). Research into action: Recommended intervention strategies for grandparent caregivers. *Family Relations*, 381-389.
- Landry-Meyer, L., & Newman, B. M. (2004). An exploration of the grandparent caregiver role. *Journal of Family Issues*, 25(8), 1005-1025.
- George, L. K. (1993). Sociological perspectives on life transitions. *Annual review of sociology*, 19(1), 353-373.

- Giarrusso, R., Feng, D., Bengtson, V. L. (2005). The intergenerational stake phenomenon over twenty years. In: Silverstein M, editor. Intergenerational relations across time and place: Annual review of gerontology and geriatrics (pp. 55–76). New York, NY: Springer.
- Giele, J. Z., & Elder, G. H. (1998). The life course mode of inquiry. *Methods of Life Course Research. Qualitative and Quantitative Approaches*. Thousand Oaks, California: Sage.
- Gieryn, T. F. (2000). A space for place in sociology. *Annual review of sociology*, 26(1), 463-496.
- Goode, W. J. (1960). A theory of role strain. *American Sociological Review*, 25(4), 483-496.
- Goodman, C. C., & Silverstein, M. (2006). Grandmothers raising grandchildren: Ethnic and racial differences in well-being among custodial and coparenting families. *Journal of Family Issues*, 27(11), 1605-1626.
- Grundy, E. M., Albala, C., Allen, E., Dangour, A. D., Elbourne, D., & Uauy, R. (2012). Grandparenting and psychosocial health among older Chileans: A longitudinal analysis. *Aging & mental health*, 16(8), 1047-1057.
- Grundy, E., & Kravdal, Ø. (2010). Fertility history and cause-specific mortality: a register-based analysis of complete cohorts of Norwegian women and men. *Social science & medicine*, 70(11), 1847-1857.
- Haddock, S. A., & Rattenborg, K. (2003). Benefits and challenges of dual-earning: Perspectives of successful couples. *The American Journal of Family Therapy*, 31(5), 325-344.

- House, J. S., Landis, K. R., & Umberson, D. (1988). Social relationships and health. *Science*, 241(4865), 540-545.
- Hayslip, B. (2003). The impact of a psychosocial intervention on parental efficacy, grandchild relationship quality, and well-being among grandparents raising grandchildren. In B. Hayslip & J. Patrick (Eds.), *Working with custodial grandparents* (pp. 163–178). New York: Springer.
- Hayslip, B., Blumenthal, H., & Garner, A. (2014). Social support and grandparent caregiver health: One-year longitudinal findings for grandparents raising their grandchildren. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 70(5), 804-812. doi: 10.1093/geronb/gbu165
- Hayslip, B., & Glover, R. (2008). Traditional grandparents' views of their caregiving peers' parenting skills: Complimentary or critical? In B. Hayslip & P. Kaminiski (Eds.), *Parenting the Custodial Grandchild: Implications for Clinical Practice* (pp. 149–164). New York: Springer.
- Hayslip Jr, B., Glover, R. J., Harris, B. E., Miltenberger, P. B., Baird, A., & Kaminski, P. L. (2009). Perceptions of custodial grandparents among young adults. *Journal of Intergenerational Relationships*, 7(2-3), 209-224.
- Hayslip, B., & Kaminski, P. L. (2005). Grandparents raising their grandchildren. *Marriage & Family Review*, 37(1-2), 147-169. doi: 10.1300/J002v37n01_10
- Hayslip, B., & Smith, G.C. (2013). *Resilient Grandparent Caregivers: A Strengths-based Perspective*. New York: Routledge.

Hayslip, B., Shore, R. J., Henderson, C. E., & Lambert, P. L. (1998). Custodial grandparenting and the impact of grandchildren with problems on role satisfaction and role meaning. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 53(3), S164-S173.

Health and Retirement Study (2011). Sample sizes and response rates. Retrieved from:

<http://hrsonline.isr.umich.edu/sitedocs/sampleresponse.pdf>

Heaney, C.A., Israel, B.A. (2008) Social networks and social support. In: Glanz K., Rimer B.K., Viswanath K (Eds). *Health Behavior and Health Education/Theory, Research and Practice* (pp. 189–207). San Francisco, CA: Jossey-Bass.

Helgeson, V. S., & Gottlieb, B. H. (2000). Support groups. In S. Cohen, L. G. Underwood, & B. H. Gottlieb (Eds.), *Social support measurement and intervention: A guide for health and social scientists* (pp. 221–245). New York, NY: Oxford University Press.

Hilbrand, S., Coall, D. A., Gerstorf, D., & Hertwig, R. (2017). Caregiving within and beyond the family is associated with lower mortality for the caregiver: A prospective study. *Evolution and Human Behavior*, 38(3), 397-403.

Hilton, S., & Elder, G. (2007). Time, self, and the curiously abstract concept of agency. *Sociological Theory*, 25(2), 170-191.

Hirsch, B. J. (1981). Social networks and the coping process: Creating personal communities. *Social networks and social support*, 4, 149-170.

- Holt-Lunstad, J., & Smith, T. B. (2012). Social relationships and mortality. *Social and Personality Psychology Compass*, 6(1), 41-53.
- Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: a meta-analytic review. *PLoS medicine*, 7(7), 859.
- House, J. S., Robbins, C. & Metzner, H. L. (1982) The association of social relationships and activities with mortality: Prospective evidence from the Tecumseh Community Health Study. *American Journal of Epidemiology*, 116, 123-140.
- Hughes, M. E., & Waite, L. J. (2002). Health in household context: Living arrangements and health in late middle age. *Journal of health and social behavior*, 43(1), 1-21.
- Hughes, M. E., Waite, L. J., LaPierre, T. A., & Luo, Y. (2007). All in the family: The impact of caring for grandchildren on grandparents' health. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 62(2), S108-S119.
- Idler, E. L., & Kasl, S. (1991). Health perceptions and survival: Do global evaluations of health status really predict mortality?. *Journal of gerontology*, 46(2), S55-S65.
- Janssen, F., & Kunst, A. E. (2005). The Netherlands epidemiology and demography compression of Morbidity research group. Cohort patterns in mortality trends among the elderly in seven European countries, 1950–99. *International Journal of Epidemiology*, 34(5), 1149-1159.
- Jendrek, M. P. (1993). Grandparents who parent their grandchildren: Effects on lifestyle. *Journal of Marriage and the Family*, 55(3), 609-621.[doi:10.2307/353342](https://doi.org/10.2307/353342)

- Johnson, C. L., & Barer, B. M. (1992). Patterns of engagement and disengagement among the oldest old. *Journal of Aging Studies*, 6(4), 351-364.
- Jones, P. S., Winslow, B. W., Lee, J. W., Burns, M., & Zhang, X. E. (2011). Development of a caregiver empowerment model to promote positive outcomes. *Journal of Family Nursing*, 17(1), 11-28.
- Jung, S. Y., Rosenzweig, M., Linkov, F., Brufsky, A., Weissfeld, J. L., & Sereika, S. M. (2012). Comorbidity as a mediator of survival disparity between younger and older women diagnosed with metastatic breast cancer. *Hypertension*, 59(2), 205-211.
- Kahn, R. L., & Antonucci, T. C. (1980). Convoys over the life course: Attachment, roles, and social support. In P. B. Baltes & O. B. Brim (Eds.), *Life-span development and behavior* (Vol. 3, pp. 253–268). New York: Academic Press.
- Kawachi, I., & Berkman, L. (2000). Social Cohesion, Social Capital, and Health (pp. 174–190).
- Kawachi, I., & Berkman, L. (2001). Social ties and mental health. *Journal of Urban health*, 78(3), 458-467.
- Kelley, S. J., Whitley, D. M., & Campos, P. E. (2013). African American caregiving grandmothers: Results of an intervention to improve health indicators and health promotion behaviors. *Journal of Family Nursing*, 19(1), 53-73.
- Kemp, C. L. (2005). Dimensions of grandparent-adult grandchild relationships: From family ties to intergenerational friendships. *Canadian Journal on Aging/La Revue canadienne du vieillissement*, 24(2), 161-177.

- Kim, D. (2008). Blues from the neighborhood? Neighborhood characteristics and depression. *Epidemiologic reviews*, 30(1), 101-117. doi: 10.1093/epirev/mxn009
- Kim, H. J., Fredriksen-Goldsen, K. I., Bryan, A. E., & Muraco, A. (2017). Social network types and mental health among LGBT older adults. *The Gerontologist*, 57(suppl_1), S84-S94.
- Kohen, D. E., Leventhal, T., Dahinten, V. S., & McIntosh, C. N. (2008). Neighborhood disadvantage: Pathways of effects for young children. *Child Development*, 79, 156-169. doi:10.1111/j.1467-8624.2007.01117.x
- Krieger, J. W., Takaro, T. K., Song, L., & Weaver, M. (2005). The Seattle-King County Healthy Homes Project: a randomized, controlled trial of a community health worker intervention to decrease exposure to indoor asthma triggers. *American journal of public health*, 95(4), 652-659.
- Landi, F., Abbatecola, A. M., Provinciali, M., Corsonello, A., Bustacchini, S., Manigrasso, L., ... & Lattanzio, F. (2010). Moving against frailty: does physical activity matter?. *Biogerontology*, 11(5), 537-545.
- Landry-Meyer, L. (1999). Research into action: Recommended intervention strategies for grandparent caregivers. *Family Relations*, 381-389.
- Landry-Meyer, L., Gerard, J. M., & Guzell, J. R. (2005). Caregiver stress among grandparents raising grandchildren: The functional role of social support. *Marriage & family review*, 37(1-2), 171-190.

- Landry-Meyer, L. & Newman, B. M. (2004). An exploration of the grandparent caregiver role. *Journal of Family Issues*, 25, 1005-1025.
- Lange, T., & Hansen, J. V. (2011). Direct and indirect effects in a survival context. *Epidemiology*, 575-581.
- Lanza, S. T., Dziak, J. J., Huang, L., Wagner, A. T., Collins, L. M., & Lanza, S. (2015). *LCA Stata plugin users' guide (Version 1.2)*. University Park: The Methodology Center, Penn State.
- Lanza, S. T., Flaherty, B. P., & Collins, L. M. (2003). Latent class and latent transition analysis. In J. A. Schinka & W. E. Velicer (Eds.), *Handbook of psychology: Research methods in psychology* (pp. 663–685). New York: Wiley.
- Lee, S., Colditz, G. A., Berkman, L. F., & Kawachi, I. (2003). Caregiving and risk of coronary heart disease in US women: a prospective study. *American journal of preventive medicine*, 24(2), 113-119.
- Lee, R. D., Ensminger, M. E., & Laveist, T. A. (2005). The responsibility continuum: Never primary, coresident and caregiver—Heterogeneity in the African-American grandmother experience. *The International Journal of Aging and Human Development*, 60(4), 295-304.
- Lee, Y., & Park, K. (2008). Does physical activity moderate the association between depressive symptoms and disability in older adults?. *International Journal of Geriatric Psychiatry: A journal of the psychiatry of late life and allied sciences*, 23(3), 249-256.

- Lee, E. T., & Wang, J. (2003). *Statistical methods for survival data analysis* (Vol. 476). John Wiley & Sons.
- Lin, N., & Ensel, W. M. (1984). Depression-mobility and its social etiology: The role of life events and social support. *Journal of Health and Social Behavior*, 176-188.
- Lin, N., Vaughn, J. C., & Ensel, W. M. (1981). Social resources and occupational status attainment. *Social Forces*, 59(4), 1163-1181.
- Little, R.J.A., & Rubin, D.B. (2002). *Statistical analysis with missing data*. Hoboken, NJ; Wiley.
- Litwin, H. (1998). Social network type and health status in a national sample of elderly Israelis. *Social science & medicine*, 46(4-5), 599-609.
- Litwin, H. (2001). Social network type and morale in old age. *The Gerontologist*, 41(4), 516-524.
- Litwin, H. (2007). What really matters in the social network–mortality association? A multivariate examination among older Jewish-Israelis. *European Journal of Ageing*, 4(2), 71-82.
- Litwin, H., & Shiovitz-Ezra, S. (2010). Social network type and subjective well-being in a national sample of older Americans. *The Gerontologist*, 51(3), 379-388.
- Livingston, G. (2013). At grandmother's house we stay: One-in-ten children are living with a grandparent. Pew Research Center. Retrieved from https://www.pewresearch.org/wp-content/uploads/sites/3/2013/09/grandparents_report_final_2013.pdf

- Longoria, R. A. (2009). Grandparents raising grandchildren: Perceived neighborhood risk as a predictor of emotional well-being. *Journal of Human Behavior in the Social Environment*, 19(5), 483-511.
- Luo, Y., Hawkey, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Social science & medicine*, 74(6), 907-914.
- Lyyra, T. M., & Heikkinen, R. L. (2006). Perceived social support and mortality in older people. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 61(3), S147-S152.
- Mahne, K., & Huxhold, O. (2014). Grandparenthood and subjective well-being: Moderating effects of educational level. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 70(5), 782-792.
- Marks, S. R. (1977). Multiple roles and role strain: Some notes on human energy, time and commitment. *American Sociological Review*, 42(6), 921-936.
- Marshall N. L., & Barnett, R. C. (1991). Race, class, and multiple role strains and gains among women employed in the service sector. *Women and Health*, 17(4), 1-19.
- Mead, G. H. (1934). *Mind. Self and Society*, Chicago: University of Chicago Press.
- Mejía, S. T., & Hooker, K. (2013). Relationship processes within the social convoy: Structure, function, and social goals. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 69(3), 376-386.

- Miller, E., Buys, L., & Woodbridge, S. (2012). Impact of disability on families: Grandparents perspectives. *Journal of Intellectual Disability Research*, 59 (1), 102–110.
- Minkler, M. (2001). Community organizing among the elderly poor in San Francisco's tenderloin district. In J. Rotham, J.L. Elrich and J.E. Tropman (eds.), *Strategies of Community Intervention*. Itasca, Ill: Peacock Publishers.
- Minkler, M., & Fuller-Thomson, D. E. (2001). Physical and mental health status of American grandparents providing extensive child care to their grandchildren. *Journal of the American Medical Women's Association*, 56(4), 199-205.
- Minkler, M., & Fuller-Thomson, E. (2005). African American grandparents raising grandchildren: A national study using the Census 2000 American Community Survey. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 60(2), S82-S92. doi: 10.1093/geronb/60.2.S82
- Minkler, M., Fuller-Thomson, E., Miller, D., & Driver, D. (2000). Grandparent caregiving and depression. In B. Hayslip & R. Goldberg-Glen (Eds.), *Grandparents raising grandchildren: Theoretical, empirical, and clinical perspectives* (pp. 207–220). New York: Springer.
- Moen, P. (2001). The gendered life course. In L. K. George & R. H. Binstock (Eds.), *Handbook of Aging and the Social Sciences* (5th ed., pp. 179-196). San Diego: Academic Press.

- Moen, P., Dempster-McClain, D., & Williams, R. M. (1992). Successful aging: A life course perspective on women's multiple roles and health. *American Journal of Sociology*, 97(6), 1612-1638.
- Musil, C. M., & Ahmad, M. (2002). Health of grandmothers: A comparison by caregiver status. *Journal of Aging and Health*, 14(1), 96-121.
- Musil, C. M., Jeanblanc, A. B., Burant, C. J., Zauszniewski, J. A., & Warner, C. B. (2013). Longitudinal analysis of resourcefulness, family strain, and depressive symptoms in grandmother caregivers. *Nursing Outlook*, 61(4), 225-234.
- Musil, C. M., & Standing, T. (2005). Grandmothers' diaries: A glimpse at daily lives. *The International Journal of Aging and Human Development*, 60(4), 317-329.
- Mutchler, J. E., & Baker, L. A. (2004). A demographic examination of grandparent caregivers in the Census 2000 Supplementary Survey. *Population Research and Policy Review*, 23(4), 359-377.
- Öhlin, B., Nilsson, P. M., Nilsson, J. Å., & Berglund, G. (2004). Chronic psychosocial stress predicts long-term cardiovascular morbidity and mortality in middle-aged men. *European heart journal*, 25(10), 867-873.
- Pearlin, L. I., Mullan, J. T., Semple, S. J., & Skaff, M. M. (1990). Caregiving and the stress process: An overview of concepts and their measures. *The gerontologist*, 30(5), 583-594.
- Penninx, B. W., Van Tilburg, T., Kriegsman, D. M., Deeg, D. J., Boeke, A. J. P., & van Eijk, J. T. M. (1997). Effects of social support and personal coping resources on mortality in

- older age: the Longitudinal Aging Study Amsterdam. *American journal of epidemiology*, 146(6), 510-519.
- Pew Research Center. (2013). At grandmother's house we stay: One-in-ten children are living with a grandparent. Retrieved from <http://www.pewsocialtrends.org/2013/09/04/at-grandmothers-house-we-stay/>
- Phua, V. C., & Kaufman, G. (2008). Grandparenting responsibility among elderly Asian Americans: The effects of householder status, ethnicity, and immigration. *Journal of Intergenerational Relationships*, 6(1), 41-59.
- Pratschke, J., Haase, T., Comber, H., Sharp, L., de Camargo Cancela, M., & Johnson, H. (2016). Mechanisms and mediation in survival analysis: towards an integrated analytical framework. *BMC medical research methodology*, 16(1), 27.
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior research methods*, 40(3), 879-891.
- Presser, H. B.(1989). Some economic complexities of child care provided by grandmothers, *Journal of Marriage and the Family*, 51(3), 581-591.
- Pruchno, R., & McKenney, D. (2000). The effects of custodial and co- resident households on the mental health of grandmothers. *Journal of Mental Health and Aging*, 6, 291–310.
- Robitaille, K.Y. (2012) *The Health of Rural Grandparents Raising Grandchildren*, Theses and Dissertations (ETD). Paper 229. <http://dx.doi.org/10.21007/etd.cghs.2012.0264>.

- Rohr, M. K., & Lang, F. R. (2014). The role of anticipated gains and losses on preferences about future caregiving. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 71(3), 405-414.
- Rook., K.S., & Sorkin, D.H. (2003). Fostering social ties through a volunteer role: Implications for older adults' psychological health. *International Journal of Aging and Human Development*, 57(4), 313-337. doi:10.2190/NBBN-EU3H-4Q1N-UXHR
- Rose, A.M. (1962). *Human behavior and social process*. Boston: Houghton Mifflin.
- Rosenheck, R. (2001). Stages in the implementation of innovative clinical programs in complex organizations. *The Journal of nervous and mental disease*, 189(12), 812-821.
- Ross, N. (2006). Grandparents and teen grandchildren: Exploring intergenerational relationships. Centre for Research on Families and Relationships. Retrieved from https://www.strath.ac.uk/media/departments/glasgowschoolofsocialwork/gccs/media_42658_en.pdf
- Ross, M. E. T., & Aday, L. A. (2006). Stress and coping in African American grandparents who are raising their grandchildren. *Journal of Family Issues*, 27(7), 912-932.
- Pelto, P., Roman, M., & Liriano, N. (1982). Family structures in an urban Puerto Rican community. *Urban Anthropology*, 11, 39-58.
- Putney, N. M., & Bengtson, V. L. (2003). Intergenerational relations in changing times. In *Handbook of the life course* (pp. 149-164). Boston, MA: Springer.

- Rubin, D. B. (1993). Discussion statistical disclosure limitation. *Journal of official Statistics*, 9(2), 461.
- Santini, Z. I., Koyanagi, A., Tyrovolas, S., Haro, J. M., Fiori, K. L., Uwakwa, R., ... & Prina, A. M. (2015). Social network typologies and mortality risk among older people in China, India, and Latin America: A 10/66 Dementia Research Group population-based cohort study. *Social Science & Medicine*, 147, 134-143.
- Schoenbach, V. J., Kaplan, B. J., Fredman, L. & Kleinbaum, D. G. (1986) Social ties and mortality in Evans County, Georgia. *American Journal of Epidemiology*, 123, 577-591.
- Schupf, N., Costa, R., Luchsinger, J., Tang, M. X., Lee, J. H., & Mayeux, R. (2005). Relationship between plasma lipids and all-cause mortality in nondemented elderly. *Journal of the American Geriatrics Society*, 53(2), 219-226.
- Settersen, R.A. (2007). The new landscape of adult life: Roadmaps, signposts, and speedlines. *Research in Human Development*, 4 (3-4), 239-252. doi:10.1080/15427600701663098
- Shakya, Y. B., Guruge, S., Hynie, M., Akbari, A., Malik, M., Htoo, S., ... & Alley, S. (2012). Aspirations for higher education among newcomer refugee youth in Toronto: Expectations, challenges, and strategies. *Refuge: Canada's Journal on Refugees*, 27(2), 65-78.
- Shanahan, M. J. (2000). Pathways to adulthood in changing societies: Variability and mechanisms in life course perspective. *Annual review of sociology*, 26(1), 667-692.

- Sieber, S. D. (1974). Toward a theory of role accumulation. *American Sociological Review*, 39, 567-578.
- Smith, K. P., & Christakis, N. A. (2008). Social networks and health. *Annual Review of Sociology*, 34, 405-429.
- Smith, G. C., Palmieri, P. A., Hancock, G. R., & Richardson, R. A. (2008). Custodial grandmothers' psychological distress, dysfunctional parenting, and grandchildren's adjustment. *International Journal of Aging & Human Development*, 67, 327-367. doi: 10.2190/ag.67.4.c
- Snyder, Z. K., Carlo, T. A., & Mullins, M. M. C. (2002). Parenting from prison: An examination of a children's visitation program at a women's correctional facility. *Marriage & Family Review*, 32(3-4), 33-61.
- Sonnega, A., Faul, J. D., Ofstedal, M. B., Langa, K. M., Phillips, J. W., & Weir, D. R. (2014). Cohort profile: the health and retirement study (HRS). *International journal of epidemiology*, 43(2), 576-585. doi: 10.1093/ije/dyu067
- Sörensen, S., & Conwell, Y. (2011). Issues in dementia caregiving: effects on mental and physical health, intervention strategies, and research needs. *The American Journal of Geriatric Psychiatry*, 19(6), 491-496.
- Sprang, G., Choi, M., Eslinger, J. G., & Whitt-Woosley, A. L. (2015). The pathway to grandparenting stress: Trauma, relational conflict, and emotional well-being. *Aging & mental health*, 19(4), 315-324.

- Stelle, C., Fruhauf, C. A., Orel, N., & Landry-Meyer, L. (2010). Grandparenting in the 21st century: Issues of diversity in grandparent–grandchild relationships. *Journal of gerontological social work*, 53(8), 682-701.
- Szinovacz, M. E., DeViney, S., & Atkinson, M. P. (1999). Effects of surrogate parenting on grandparents' well-being. *Journal of Gerontology: Social Sciences*, 54B, S376–S388.
- Tay, L., Tan, K., Diener, E., & Gonzalez, E. (2013). Social relations, health behaviors, and health outcomes: A survey and synthesis. *Applied Psychology: Health and Well-Being*, 5(1), 28-78. doi: 10.1111/aphw.12000
- Tennant, B., Stellefson, M., Dodd, V., Chaney, B., Chaney, D., Paige, S., Alber, J. (2015). eHealth Literacy and Web 2.0 Health Information Seeking Behaviors Among Baby Boomers and Older Adults, *Journal of Medical Internet Research*, 17(3), e70, doi: 10.2196/jmir.3992
- Therneau, T. M., & Grambsch, P. M. (2000). The Cox model. In *Modeling survival data: extending the Cox model* (pp. 39-77). Springer, New York, NY.
- Thielemann, P. A., & Conner, N. E. (2009). Social support as a mediator of depression in caregivers of patients with end-stage disease. *Journal of Hospice & Palliative Nursing*, 11(2), 82-90.
- Thoits, P. A. (2010). Stress and health major findings and policy implications. *Journal of health and social behavior*, 51(1), S41-S53.

- Tolsdorf, C. C. (1976). Social networks, support, and coping: An exploratory study. *Family Process*, 15(4), 407-417.
- Uchino, B. N. (2006). Social support and health: a review of physiological processes potentially underlying links to disease outcomes. *Journal of behavioral medicine*, 29(4), 377-387.
- Umberson, D., Crosnoe, R., & Reczek, C. (2010). Social relationships and health behavior across the life course. *Annual review of sociology*, 36, 139-157.
- United Nations (2007). Retrieved from

<http://www.gu.org/LinkClick.aspx?fileticket=Lgq5WfhP-Tg%3D&tabid=157&mid=606>
- van den Brink, C. L., Tijhuis, M., van den Bos, G. A., Giampaoli, S., Nissinen, A., & Kromhout, D. (2005). The contribution of self-rated health and depressive symptoms to disability severity as a predictor of 10-year mortality in European elderly men. *American Journal of Public Health*, 95(11), 2029-2034.
- VanWey, L. K., & Cebulko, K. B. (2007). Intergenerational coresidence among small farmers in Brazilian Amazonia. *Journal of Marriage and Family*, 69(5), 1257-1270.
- Veisi, M. S., Rezaei, S., & Salehivaysi, K. (2017). Comparing sensitivity of radial basis function method with multilayer perceptron network and Cox proportional hazard model in survival data. *International Journal of Computer Science and Network Security*, 17(7), 180-187.

- Walter-Ginzburg, A., Blumstein, T., Chetrit, A., & Modan, B. (2002). Social factors and mortality in the old-old in Israel: The CALAS study. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 57(5), S308-S318.
- Ward, C.R. (1986). The meaning of role strain. *Advances in nursing science*, 8(2), 39-49.
- Whitley, D. M., Fuller-Thomson, E., & Brennenstuhl, S. (2015). Health characteristics of solo grandparent caregivers and single parents: A comparative profile using the Behavior Risk Factor Surveillance Survey. *Current gerontology and geriatrics research*, 2015.
- Whitley, D.M., Kelley, S., & Campos, P. (2011). Perceptions of family empowerment in African American custodial grandmothers raising grandchildren: Thoughts for research and practice, *Families in Society*, 92(4), 383-389. doi: 10.1606/1044-3894.4148
- Whitley, D. M., Kelley, S. J., & Campos, P. E. (2013). Promoting Family Empowerment Among African American Grandmothers Raising Grandchildren. In B.Hayslip., & G.C. Smith (Eds), *Resilient Grandparent Caregivers: A Strengths-based Perspective*, (pp.235-250). New York: Routledge.
- Wing, R. R., & Jeffery, R. W. (1999). Benefits of recruiting participants with friends and increasing social support for weight loss and maintenance. *Journal of consulting and clinical psychology*, 67(1), 132-138.
- WHO. (1984). Health promotion. A discussion document on the concept and principles Health promotion. Copenhagen: World Health Organization.

- Wohl, E., Lahner, J., & Jooste, J. (2003). Group processes among grandparents raising grandchildren. In B. Hayslip & J. Patrick (Eds.), *Working with custodial grandparents* (pp. 195–212). New York: Springer.
- Yang, Y. C., McClintock, M. K., Kozloski, M., & Li, T. (2013). Social isolation and adult mortality: the role of chronic inflammation and sex differences. *Journal of health and social behavior*, 54(2), 183-203.
- Yoon, S. M. (2005). The characteristics and needs of Asian-American grandparent caregivers: A study of Chinese-American and Korean American grandparents in New York city. *Journal of Gerontological Social Work*, 44(3), 75-94.